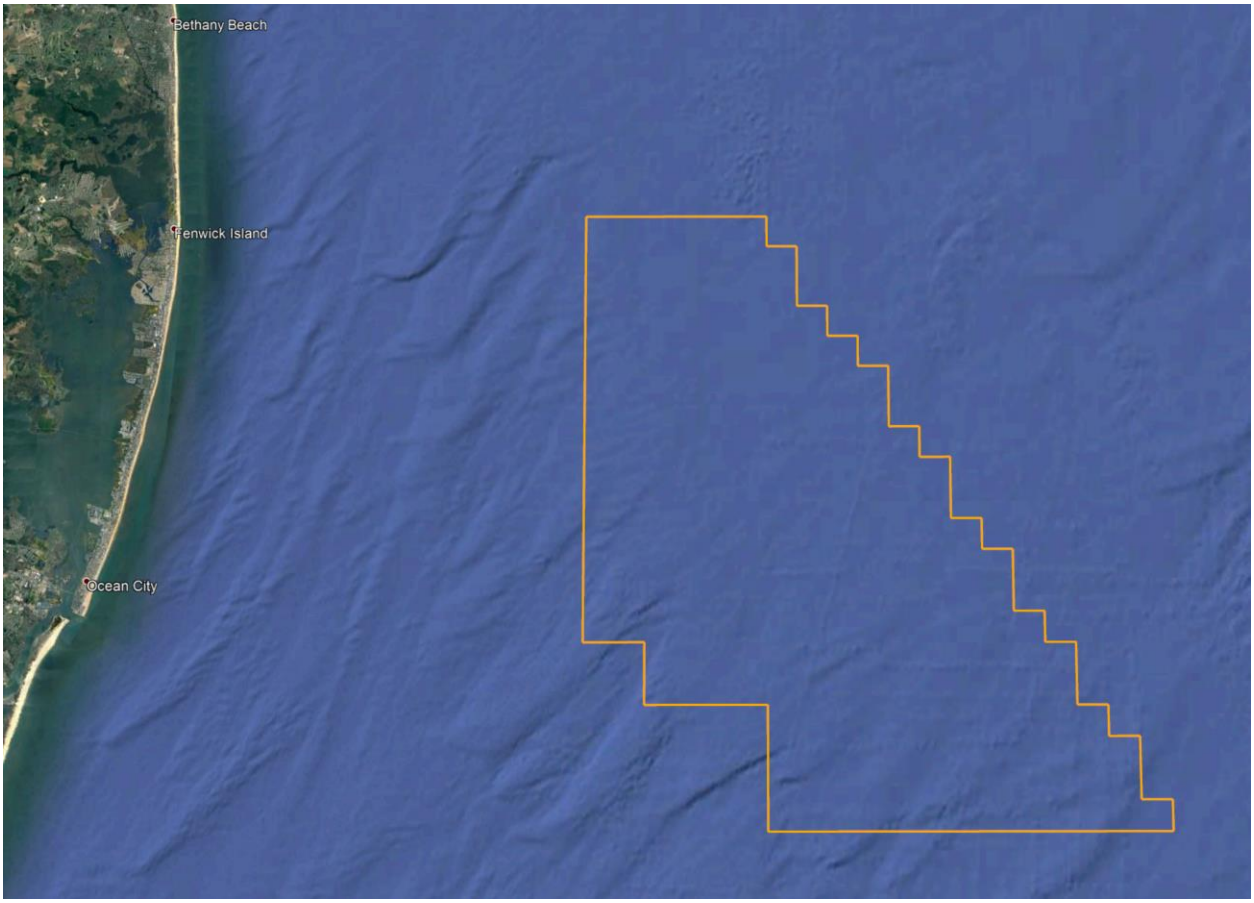
US Wind Maryland

Fisheries Assessment Report



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Executive Summary

Various forms of commercial and recreational fishing activity occur in and around the US Wind Offshore Wind Lease Area, OCS-A 0490 ("Lease Area"). For the twelve years spanning 2008-2019, the average annual commercial landings were ~316,000 pounds, and associated annual revenue was ~$218,000 (NOAA Fisheries, 2020). In comparison to some areas of the region, the Lease Area may be considered lightly fished. However, for those fishers that do utilize the area, this catch contributes a significant portion of their annual revenue. It should also be noted that some fishermen may hold a license but choose to not gear up and fish during a given season if the market or fishery conditions have a poor forecast, or for other personal reasons. Market conditions related to the global pandemic in 2020 and 2021 can be assumed to cause an abnormal reduction in market access for fishermen. This report may be updated as more recent data are published and analyzed.

The most widespread commercial fishery conducted in and around the Area is the harvesting of whelk ("conch") using baited traps ("pots") set on the seabed ('fixed gear'). The lines and buoys used to mark and recover the gear from the surface are subject to interaction during the planning (e.g., survey) and construction phases of the project. Once installation is complete, the ability to conduct this fishery is no longer expected to be impacted by the operational wind farm. Around eight to ten fishermen are active in the local whelk fishery, based in Ocean City, MD and one or two generally working from Lewes, DE.

Secondarily, a pot fishery for black sea bass is conducted in and around the Lease Area by a relatively small number of operators (less than ten individual owner/operators). At least two license-holding fishermen include a few baited lobster traps within a string of mostly sea bass gear. The issues regarding interaction with this fishery are similar to those of conch pots, as surface buoys and lines are subject to interaction during the planning and construction phases of the program-- but the ability to fish after installation is complete should not be impacted. An important concern to highlight regarding this fishery is the location of the fishing grounds along the eastern boundary of the Lease Area and near the Delaware Bay Traffic Separation Scheme (TSS).

Bottom gillnet fishing is conducted seasonally by a small number of vessels in and around the Lease Area targeting dogfish and black sea bass. Closer to shore, and of potential concern for the export cable route, are smaller gillnet fisheries for species of opportunity. As with the other fixed gear fisheries, surface buoys and lines are subject to interaction during the planning and construction phases of the program but the ability to fish once installation is complete should not be impacted.

Dredge fisheries for surf clam have taken place historically in the Lease Area, at one time providing a thriving sector in Ocean City, Maryland. However, changing environmental conditions have pushed this fishery further north and offshore, with only limited activity in recent years within the Lease Area. While surf clam dredge vessels still utilize the port of Ocean City, MD to offload product, the fishing effort takes place east of the Lease Area, and north of the Delmarva region.

Scallop dredge vessels also utilize the port of Ocean City, MD while working fishing grounds outside of the Lease Area. While Scallops once made up the number one species in terms of

average annual revenue from the Lease Area (~$72,000), the average annual landings (~7,000 lbs.) have been declining, with no obvious fishing effort within the Lease Area in recent years.

Bottom trawl fisheries for mixed species take place with some activity reported to historically overlap in the southeast portion of the Lease Area. Black sea bass, summer flounder and other species are taken by trawl.

There are also several vessels from Ocean City, MD that conduct bottom trawling and lightweight dredging for horseshoe crab *(Limulus Polyphemus)* to the west of the Lease Area, between 1 and 3 nm from shore. The fleet is based in Ocean City and mostly fishes in State waters of Maryland. At least one of the Ocean City-based vessels fishes occasionally in Delaware State waters. While not identified as taking place inside the Lease Area, the export cable route activities (e.g., survey and installation between the Lease Area boundary and potential cable landing sites) could be impacted by the fishery. The northern portion of the Lease Area overlaps the southern region of Carl N. Shuster Jr. Horseshoe Crab Reserve that provides feeding and maturation habitat for juvenile and adult crab. Fishing for horseshoe crab is prohibited inside the Reserve, which has a western boundary established from 3 nautical miles offshore.

The horseshoe crabs are used as bait for the conch and eel pot fisheries but are also of primary importance for their blood, which is utilized to test for endotoxin contamination in vaccines, and has been prominent in the development of vaccines against SARS-Cov-2-- the virus that causes the Covid-19 respiratory disease. This use, the importance of horseshoe crab eggs as food (fuel) for migrating shorebirds, and the overlap of the Lease Area with the Carl N. Shuster Jr. Horseshoe Crab Reserve have elevated the local importance of this species in offshore wind planning discussions.

As environmental conditions change, species shifts occur that may result in fishing effort shifts within existing fisheries as well as the development of new fisheries. White shrimp have been expanding their range, and a fishery has developed in the coastal Virginia waters. It is possible that such a fishery could develop in the coastal waters of Maryland and Delaware. Although unlikely to expand offshore as far as the Lease Area, a trawl fishery could develop over the export cable route.

Fishing vessel transits through the Lease Area from Ocean City, MD would primarily be in an east/west orientation for vessels accessing offshore fishing grounds. This would be true for recreational and commercial vessels. Vessels from ports to the north and south of the Lease Area may cross the lease in more of a north/south orientation. Thus, an east-west layout of the turbine array is likely to be most favorable for local Maryland and Delaware fishers while those from regional ports may prefer a layout that supports north/south transits.

Apart from bottom trawling and dredge fisheries that take place primarily in State waters west of the Lease Area and in Exclusive Economic Zone waters east of the Lease Area, respectively, the commercial and recreational fisheries that utilize the Lease Area are of low concern regarding external aggression and damage to inter-array and export cables. US Wind plans to bury the cable to target depths of approximately 1 to 3 meters (3.3-9.8 ft.), but not more than 4 meters (13.1 ft.).

Establishing communication with the different fisheries user groups as early as possible is essential to understanding how best to coexist, target main sources of disinformation and correct them, identify research funding opportunities, and create a long-term plan for cooperative and mutually beneficial relationships with the various fishing communities - not all of which are aligned with one another. Of equal importance will be the ability to access and incorporate both anecdotal and empirical data into the discussion of wind farm layouts and turbine spacing.

Fishermen have identified several concerns that may help drive discussion on research needs and help develop plans to carry out early and ongoing monitoring of the Lease Area and export cable route environment from survey through the operational lifecycle of the project. Identifying opportunities to maintain the viability of stock assessment surveys conducted by the National Oceanographic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) as well as State and Regional stock assessment surveys and habitat studies should also be considered a high priority.

1 Introduction

1.1 Study Scope and Objectives

US Wind, Inc. plans to develop the approximately 80,000-acre U.S. Outer Continental Shelf (OCS) Lease Area (OCS-A 0490), its western boundary ~10.5 nautical miles east of the Ocean City, Maryland inlet. Sea Risk Solutions, LLC has been engaged to assess the commercial and recreational fishing activities that utilize the Lease Area and have potential to interact with the export cable route to shore.

1.2 Methodology and Data Sources

Information supporting the development of this assessment will be taken from a review of various data maritime data portals, including:

- Marine Cadastre
- Mid-Atlantic Ocean Data Portal (MARCO)
- Northeast Ocean Data
- Greater Atlantic Regional Fisheries Office (GARFO) https://www.fisheries.noaa.gov/resources/maps
- Maryland Mapping & GIS Data Portal https://imap.maryland.gov/pages/default.aspx
- NOAA-Fisheries (2021). Descriptions of Selected Fishery Landings and Estimates of Vessel Revenue from Areas: A Planning-level Assessment. https://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/WIND/WIND_AREA_REPORTS/US_Wind_1.html.

Additionally, data has been sourced from various fisheries management plans and associated reports prepared by regional fisheries management councils as well as State fisheries age`ncies. Further data was sourced from fisheries studies conducted for offshore wind development that are in the public domain.

Historical Automatic Identification System (AIS) data were also used to identify vessel activity in and around the Lease Area. Anecdotal information from direct communications with fishermen has also been used where updated information was not readily available.

2 Commercial Fishing

2.1 Regional Overview

2.1.1 Who

Mid-Atlantic fisheries are regional. The primary regional commercial fishing ports, whose fishers utilize the Lease Area, are Ocean City, MD and Cape May, NJ. The smaller ports of Indian River, DE, Lewes, DE, Sea Isle City, NJ, and Chincoteague, VA also have vessels that fish the area. Vessels from as far north as New Bedford, MA and as far south of Beaufort, NC may fish in the continental shelf waters off Maryland and/or utilize its commercial fishing port facilities, primarily Ocean City.

The primary landings by volume and value in the State of Maryland are derived from inshore fisheries such as blue crab, striped bass, and oysters, respectively. Understanding the habitat of these species, it can be seen that the Chesapeake and Delaware Bays are highly significant to the fisheries value and volume. Additional species of regional significance, landed in Maryland

and adjacent States' waters, include whelk ("conch"), black sea bass, eel, lobster, Atlantic sea scallops, flounders, monkfish and other finfish species, sharks, and occasionally squid. The primary gear utilized are pots/traps, trawls, gillnets, hook/line, dredges, and purse seines. As noted elsewhere in this report, the horseshoe crab fishery is small (limited to a catch of 500,000 male crabs/year taken by 4-5 vessels based in Ocean City) but also significant for biomedical and bait purposes.

2.1.2 Where

The waters off Maryland are part of what is commonly referred to as the Mid-Atlantic Bight, which stretches from New York to Virginia. The Lease Area being discussed is limited to the shallow waters, <140' water depth (<42m WD; <23 fathoms WD), on the continental shelf area. Although many of the fisheries discussed will take place throughout the Mid-Atlantic region, this assessment focuses on those within the Lease Area and adjacent waters between the Lease Area and the shore, as well as the principal fisheries in deeper water along the eastern boundary of the Lease Area, which necessitate through-transit of the Lease Area.

Gear Type	Approx. seabed penetration (cm)	Location	Season	Species Targeted	Est. Number of vessels
Bottom Otter Trawl (inshore)	To about 30 cm	<180' water depth Massachusetts through North Carolina	October - April	Nearshore trawl fishery targets Atlantic croaker, weakfish, butterfish, bluefish, monkfish, summer flounder (fluke), winter flounder, hake (whiting), dogfish, scup, black sea bass, menhaden, striped bass, kingfish, other. Most of this category of trawl activity is inshore of the Lease Area	633 total estimate from NOAA Fisheries
Bottom Trawl (offshore)	30cm	>180' water depth Massachusetts through North Carolina	November - April	Deep water trawl fisheries outside of the Lease Area target bluefish, Atlantic mackerel, Loligo squid, black sea bass, and scup.	633 Total estimate from NOAA Fisheries
Horseshoe crab Bottom Trawl	<30 cm	Between 1nm and 3nm from	May 1 – July 5	Horseshoe crab	4-5 (Ocean City)

Gear Type	Approx. seabed penetration (cm)	Location	Season	Species Targeted	Est. Number of vessels
		shore;			
Horseshoe crab Bottom Trawl, Dredge, Beam Trawl, Seine	<30cm	All Maryland waters	July 6 –Nov. 30	Horseshoe crab	4-5 (Ocean City)
Beam Trawl; Otter trawl	<30cm	*Not yet established—potential for inshore/State waters	Approx. Oct – Dec.	*White Shrimp	None yet
Hydraulic/mechanized clam dredge	<30 cm per pass, cumulative/abnormal penetration reported 1+ m	<240' water depth	Year round	Surf clam/ Ocean quahog	Locally fewer than 5; regional fleet < 50
Trap/Pot	<30cm	Subsea features and wrecks; most takes place in the southeast extremity of the Lease Area and adjacent waters to the east	Black sea bass generally May-November depending on sea temp and weather (Lobster April 1 – January 30)	Black sea bass & Lobster	Less than 10
Trap/Pot	5cm	Bays, estuaries of Delaware and Maryland; not a significant fishery in the Lease Area	Mar. – Dec. (Sport fishing with trap and spear open year around)	American Eel	Expected less than 12 commercial harvesters in Chesapeake and Delaware Bays combined

Gear Type	Approx. seabed penetration (cm)	Location	Season	Species Targeted	Est. Number of vessels
Trap/Pot	5cm	All waters	April – Jul.; Sep. – Jan.	Conch/Whelk (channeled whelk, knobbed whelk)	Less than 12 commercial vessels
Gillnet	10cm (anchors)	<180m	Year around	Black sea bass; dogfish; spot, other.	Less than 10

Table 1.1: Fisheries Risks at a Glance

2.2 Bottom Otter Trawl

2.2.1 Fishery Description

Bottom trawling for mixed species is reported inside the Lease Area, with most of that effort taking place in the central and southern section. Outside the Lease Area, light to moderate bottom trawling for horseshoe crab and mixed finfish occurs largely along the boundary of State waters (between 1-3 nautical miles from shore). In the northern region of the Lease Area, mixed species bottom trawl activity can also be expected, but not with great intensity.

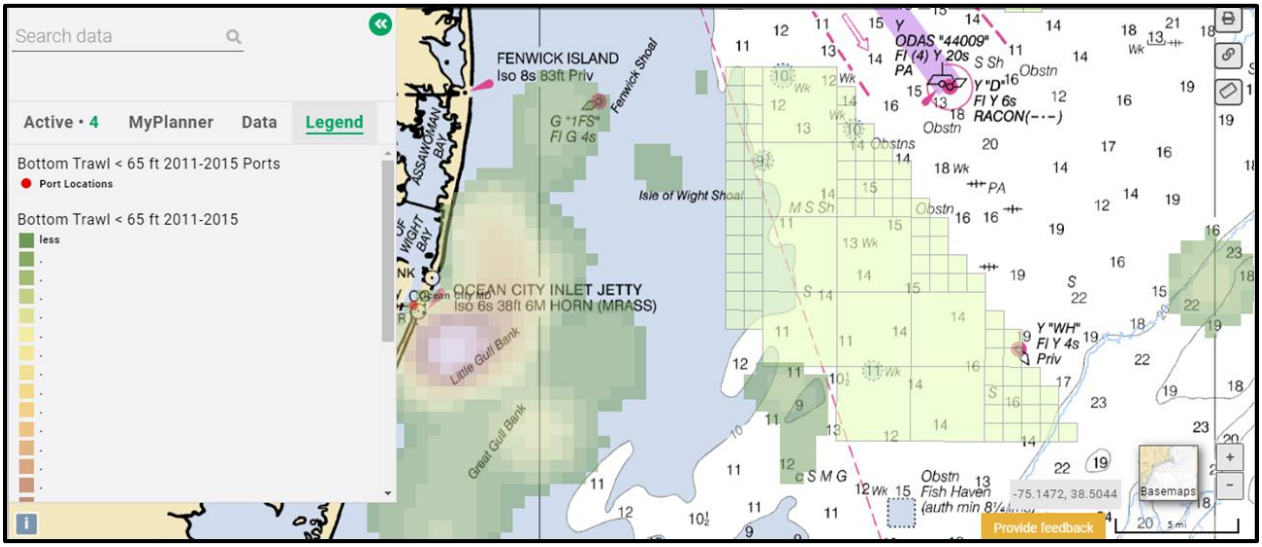

Figure 2.1: Heat map of bottom trawl activity by vessels less than 65', 2011-2015. Depth shown in fathoms (Source: MARCO Data Portal)

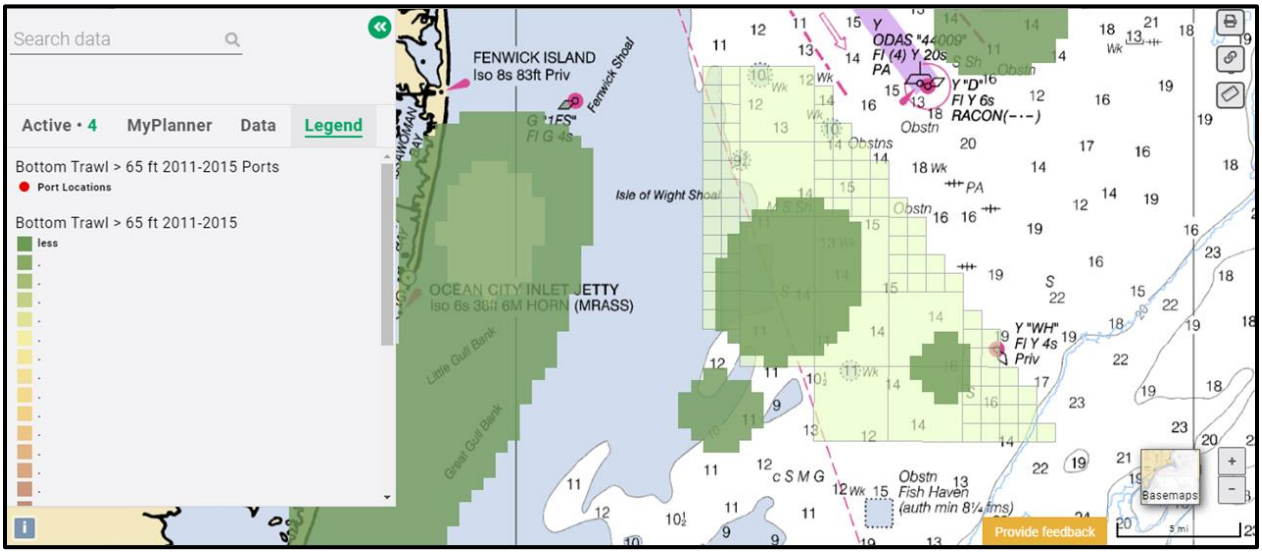

Figure 2.2: Heat map of bottom trawl indicates a low level of activity by vessels greater than 65', 2011-2015. Depth shown in fathoms (Source: MARCO Data Portal)

The bottom trawl effort within the Lease Area is relatively low and trawl fisheries are not expected to pose a significant engineering concern for inter-array cables in the Lease Area or the export cable, as long as target cable burial is achieved.

2.2.2 Gear Description

The gear used in the region consists of a single net towed behind the vessel with otter boards (trawl doors) providing the force necessary to spread the net (Figure 2.3). The otter boards, of various shapes and sizes (Figure 2.3), are also the primary point of bottom contact. They are not designed to dig deeply into the seabed but ride on the seabed. The seabed penetration that does occur, typically less than 12" (~30cm) in soft sediments, creates bottom sediment disturbance that helps to 'herd' fish into the net.

Significant seabed penetration by trawl gear is not desirable for the operator as it increases cost to the vessel in the form of reduced fuel efficiency and wear/tear on the gear.

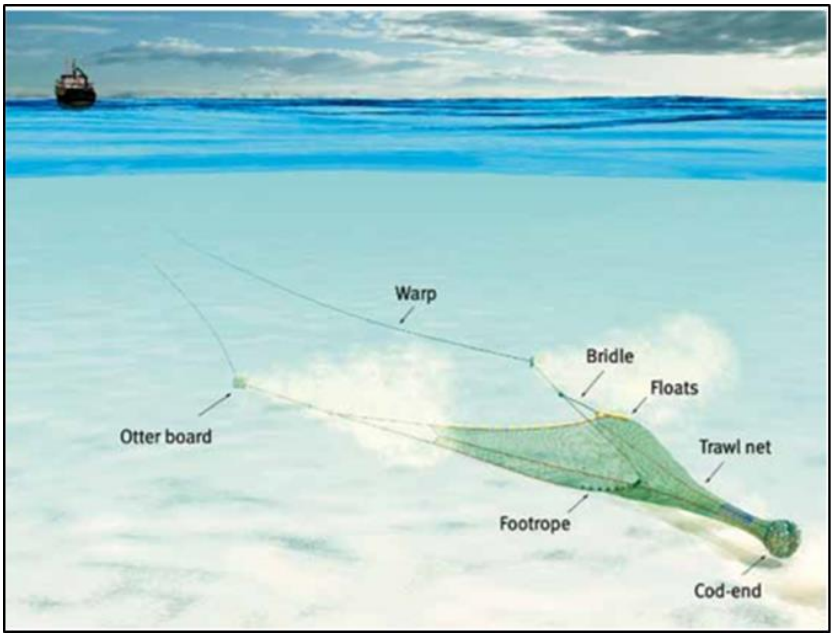

Figure 2.3: Example of a bottom trawl configuration and otter boards.

Figure 2.4: The fishing trawler Instigator delivers her catch in Ocean City MD. Typical otter board trawl doors can be seen shipped near the vessel stern. (Photo: Wolfgang Rain/Sea Risk Solutions).

2.2.3 Fishing Effort - Lease Area and Export Cable Routes

As previously noted, fishing effort exists to a limited extent within the central and southern parts of the Lease Area, and seasonally inshore. Trawlers working the Lease Area and inshore grounds are primarily from the port of Ocean City. Fishing effort data is limited to anecdotal observations and fishing effort heat maps from the MARCO data portal (Figures 2.1 – 2.2).

2.2.4 Use within Lease Area

As previously noted, bottom trawl fishing has not been frequently observed within the Lease Area. For completeness of this assessment, a description of fishing styles, scale drawings of vessels within a turbine array are included. Vessel size, gear used, and fishing styles vary significantly in the region. Fishing styles are influenced by captain preference, experience, catch rate, water depth, seabed type, weather, and other factors.

What is clear from AIS data is that fishermen can, and routinely do, make multiple tows safely and effectively in very narrow swaths of seabed. Fishermen are skilled at controlling gear placement on the seabed; tows can be made alongside and/or between known seabed obstructions (hangs). Vessels typically prefer to tow in straight lines along consistent depth contours at speeds from 3-4 knots. Although trawls catch more effectively along a straight line, fishermen may sometimes tow through a turn.

Wide, sweeping turns around obstructions can be made with gear fully engaged on the seabed. Tight turns can be made by retrieving trawl doors back to the vessel while the net remains in the water, or by completely hauling the gear to dump the catch, then setting back in. Turning circles (diameters) of various sizes are possible depending on the method and trawl gear configuration used.

2.3 Pot/Trap

2.3.1 Fishery Description

"Pot" gear consists of different types of traps set on the seabed either baited or un-baited. It is the most common type of commercial fishing gear in the Lease Area. In the waters off Maryland and Delaware, the species targeted are black sea bass, whelk (a type of marine snail colloquially called "conch"), eels, crabs, and lobster. Of primary concern for the US Wind Lease Area are the black sea bass and conch fisheries. Eels are most commonly sought in the bays but may also be taken in the near-shore ocean environment.

Black sea bass are taken using un-baited, rectangular traps with dimension about 44" x 24" x 14", made of wire mesh, wood, or wood and wire. They are usually set near sunken structures such as wrecks or around rocks, topographic outcroppings, or depressions that provide protection from currents and predators. Several small areas 90' deep in the Lease Area are seasonally targeted by local black sea bass fishermen. Black sea bass traps are most often set in strings of about 12 to 36 traps connected by a ground line, and marked with a buoy at one or both ends. Fishermen report that most of the fishery takes place to the south and eastern margin of the Lease Area, but it is not uncommon to set traps in specific spots inside the middle of the Area, and near the northern part. Thus, it is important to have contact with local black sea bass fishers in Ocean City, MD, Indian River, and Lewes, DE in case a request is necessary to temporarily shift gear off the survey route and to mitigate impacts to fisheries during installation.

Since the traps are un-baited, black sea bass pots are often left for a week or more between checking, and after retrieval, are often set back in or near the same location throughout the season. Because black sea bass are attracted to subsea structures, they have been observed as one of the first large fish species to take up residence around monopile turbine towers and to feed among the rock piles placed as scour protection around their bases.

Channeled whelk and knobbed whelk are taken by baited, open-topped traps made of wood slats or plastic. The snails climb up the sides of the "pot" and congregate around the bait bag placed inside. Conch pots are most often set singly with a single buoy attached, buy may also be set in strings of multiple pots. The buoys are usually small, bullet-shaped floats and fishers often use a particular color scheme to identify their gear. The conch fishery is water temperature dependent and takes place mostly during the fall and early winter, with a smaller but consistent effort during spring through early summer. This fishery is known to take place across the Lease Area, and care must be taken to watch for buoy markers and avoid towing gear too close that could snag the vertical lines. Scout vessels are advised to work in advance of offshore operations and in coordination with operational vessels to identify gear and its owner, and to clear lost or abandoned fishing gear.

The American eel is targeted in near-shore coastal and estuarine waters from March – December, with most effort taking place in inshore, shallow waters in summer and fall. The fishery uses baited traps that may be either cylindrical or similar in form to rectangular, wire-mesh black sea bass pot, but with a smaller mesh size to prevent escape of the eels. Eel pots are normally fished singly, as with conch pots, and comprise a small but important export market and may also be caught as bait for blue crab pot fishing in the bays.

For fixed-gear fisheries, the primary concern will be gear interactions during survey and marine operations. These interactions can be mitigated by communications with the fishermen as development operations in the area are planned. A process for addressing gear loss and damage claims should be implemented.

External aggression risk to the subsea assets from fixed gear is not expected.

2.3.2 Gear Description

Pots and traps are set in 'strings' or 'trawls' – (not to be confused with trawl nets, which are a towed gear) that consist of multiple pots strung together along a 'groundline' anchored to the seabed. They may also be set singly, as is the case in the conch pot fishery. The gear can be rectangular, square, or cylindrical and is linked to the surface with buoy lines connected to buoys and sometimes highflyers (Figure 2.5 below). The anchors used to secure the gear to the seabed may consist of a range of materials. When the gear is recovered to the surface via the buoy lines, the anchors and traps can be dragged along the seabed and penetrate it. This penetration is typically minor and unlikely to damage subsea infrastructure.

Asset damage related to this fixed gear fishery may result in the event the surface markers become detached and the gear must be recovered by dragging a grapnel along the seabed. Such activities are also unlikely to damage a buried and armored cable, but they should be considered during asset planning.

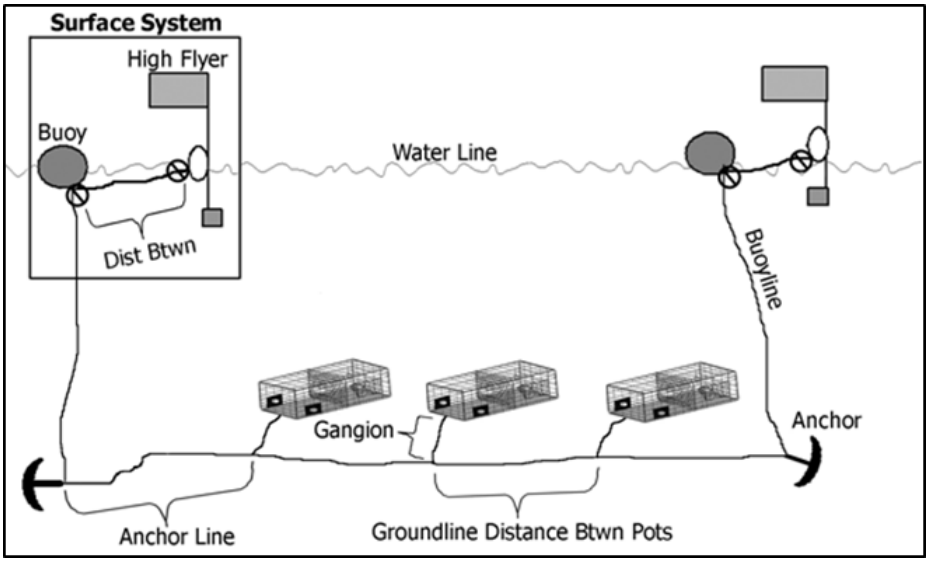

Figure 2.5: Configuration of pot/trap 'string' or 'trawl'.

Figure 2.6: Examples of pot string stored on vessel deck prior to deployment.

Figure 2.7: Example of pot vessel with buoys and highflyers stored on vessel deck

Figure 2.8: Conch gear stacked on the dock in Ocean City, Maryland.

2.3.3 Fishing Effort - Lease Area and Export Cable Routes

Fishing with pots and traps occurs diffusely throughout the Lease Area but is most intensive along the eastern and southeastern boundaries (Figure 2.9 below), while one or two fishers are known to fish with conch pots west/northwest of the lease area off Delaware, and west of the Lease Area off Maryland. Once the gear is set, it will typically 'soak' for several days; duration of the soak is determined by target species and the catch rate. Traps that are baited (e.g., conch) will typically be hauled more frequently since the bait will not last more than a few days.

Black sea bass gear will typically be set near bottom depressions, natural or man-made obstructions, which act as reef structures to attract fish and provide shelter. Structures or obstructions also serve to protect the fixed gear from mobile gear fishermen. Conch gear will be moved throughout the fishing season.

Anecdotal information from local fishermen indicates that there is little, if any, fishing from January to March. Fishermen will begin to set gear in the early to mid-April timeframe and fish through December. Catch rates for black sea bass are typically highest in the spring and fall, when the gear will be hauled more frequently. The gear will be hauled less frequently in the summer months, when catch rates are low, but the gear will remain on site.

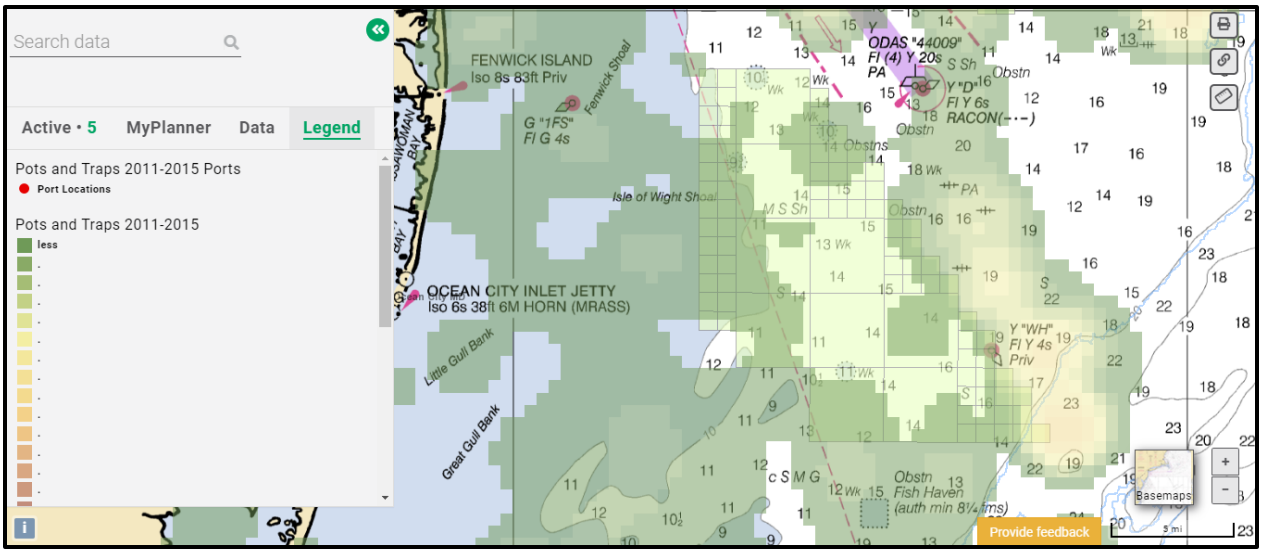

Figure 2.9: Heat map of pot/trap fishing effort near the Lease Area from 2011 – 2015 (MARCO Data Portal); water depth is given in fathoms.

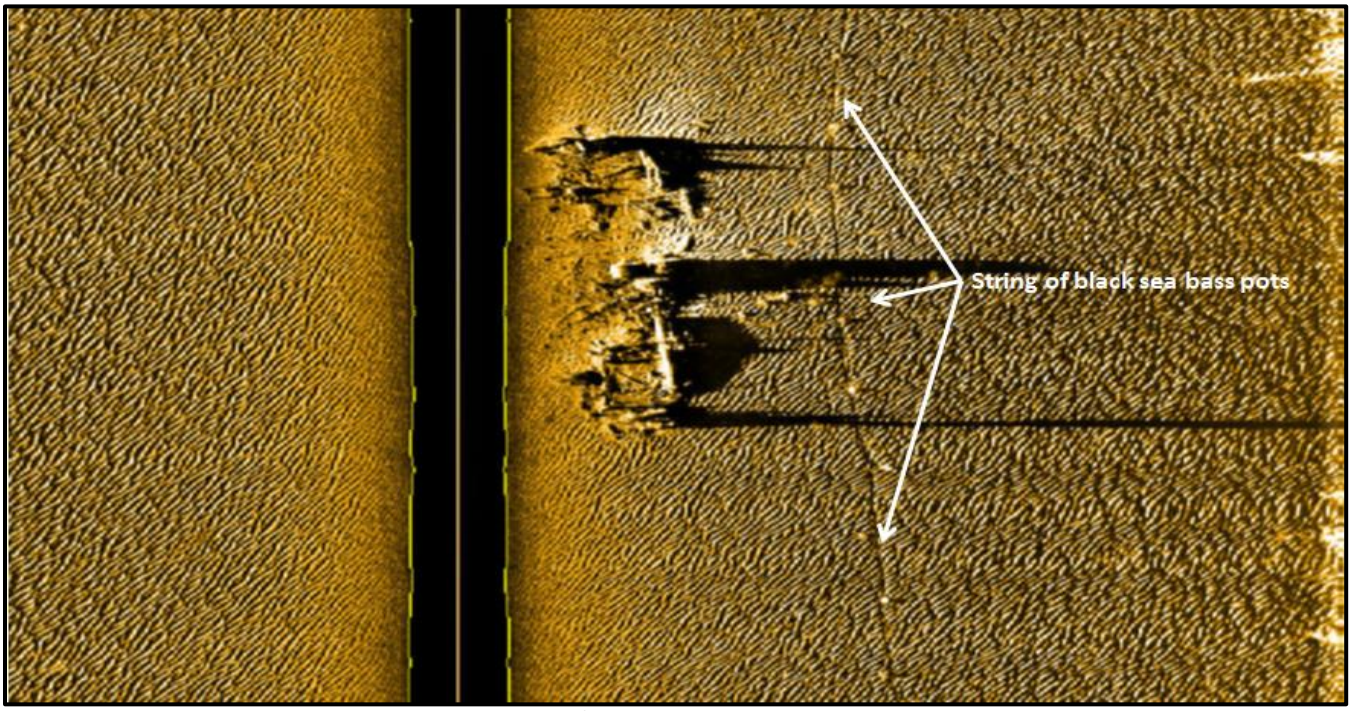

Figure 2.10: Side-scan sonar image of a string of pots/traps set alongside a seabed structure.

2.4 Bottom/Drift Gillnet

2.4.1 Fishery Description

The gillnet fishery consists of effort that is targeted on the seabed, bottom tending gillnets, and floating (drift) gillnets. Both fisheries are conducted within the Lease Area and along the export cable route(s). It is primarily the drift gillnet effort that exists within the northern part of the Lease Area while both fixed and drifting gear will be used along the northern export cable route.

Bottom tending gillnet fisheries will target dogfish, skate, monkfish, sea bass, and some other species along the northern export cable route and, to a lesser extent, within the northern portion of the Lease Area. Nets are set in strings, anchored in place, and hauled periodically. Soak time will be dependent on the target species and catch rates; soak durations of multiple days are not uncommon. When the gear is recovered to the surface via the buoy lines, the anchors can be dragged along the seabed and penetrate it. This penetration is typically minor and unlikely to damage subsea infrastructure. However, should the surface markers become detached from the gear, then recovery is done by dragging a grapnel along the seabed. Such activities are also unlikely to damage a buried and armored cable, but they should be considered during project planning.

Floating (drift) gillnets will typically be used to target species of opportunity, including bluefish, weakfish, and several species of shark. The gear is set on fish that are located (marked) with onboard electronics and hauled with minimal soak time; vessels remain w/gear during 'soak'. Most of this activity takes place inshore of the Lease Area.

The primary concern regarding the gillnet fisheries will be the risk of gear interactions during marine operations. These interactions can be mitigated by communications with the fishermen

as development operations in the area are planned. A process for addressing temporary gear relocation as well as gear loss and/or damage claims should be implemented.

External aggression risk to the subsea assets is not expected to be an issue.

2.4.2 Gear Description

Gillnets are rectangular panels of net constructed of monofilament or synthetic materials that are joined to form strings of gear. Bottom tending sink gillnets are deployed (or 'fished') in a way very similar to the previously described pot/trap gear. Each net panel consists of a float line and a weighted lead line; panels are linked together to form a 'string' of gear. Depending on the target species, the gear can stand as high as 20' off of the seabed; distance between the leadline and the float line varies from 6' to about 30', depending on water depth and target species. The string, which can be 2,000' or longer, is anchored to the seabed and linked to the surface with buoy lines connected to highflyers (Figure 2.11).

Floating (drift) gillnets are configured in very much the same way, they have a float line and a lead line, but they are supported from the surface by a series of buoys (Figure 2.12). The string of gear can be over a mile long, deployed length impacted by target species as well as weather and oceanographic conditions. The length of the buoy/float lines will determine the depth that the gear fishes below the surface. In most cases, the net is tended and remains attached to the vessel to keep it from drifting back on itself. Soak time can be less than an hour depending on the target species.

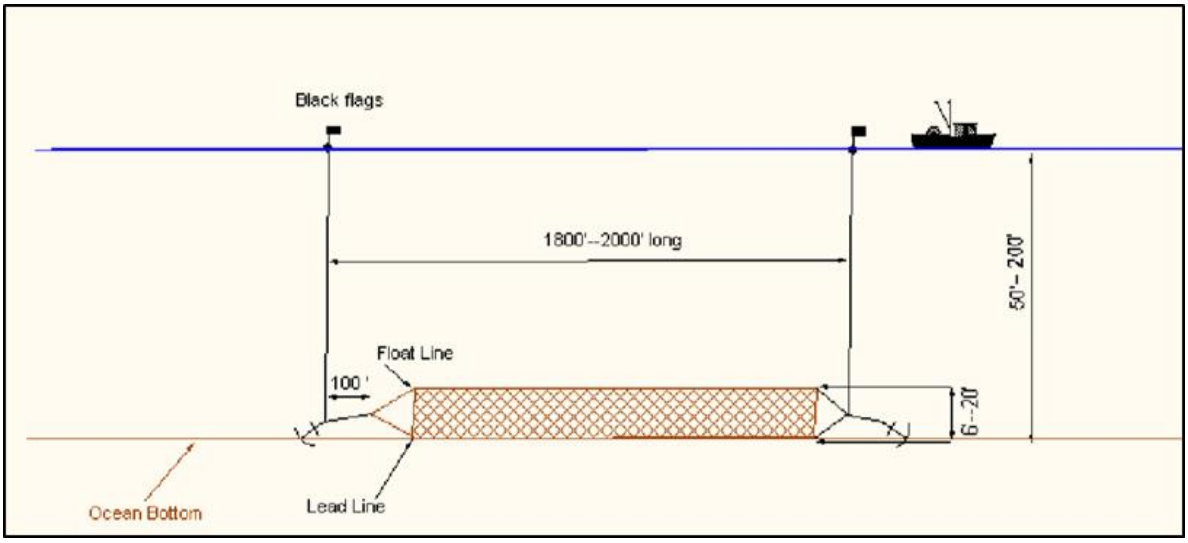

Figure 2.11: Example of a string of bottom tending sink gillnet gear.

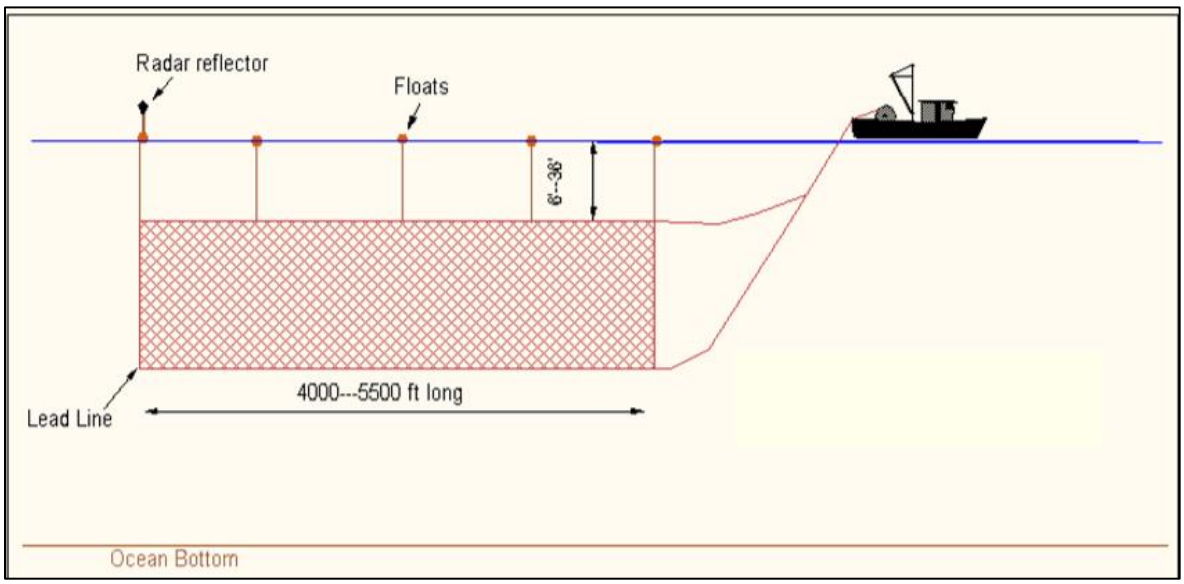

Figure 2.12: Example of drifting gillnet gear.

Figure 2.13: Deck of gillnet vessel with net reel loaded for black sea bass fishing.

2.4.3 Fishing Effort - Lease Area

Bottom gillnet fishing occurs inside and outside of the Lease Area (Figure 2.14). Vessels fishing bottom tending gillnets for black sea bass and other species work from Ocean City, in and adjacent to the Lease Area. Vessels will also target spiny dogfish from fall through spring (October-May); this activity is mostly inshore of the Lease Area, and may be sporadic with less activity in the winter months due to quota availability and winter conditions. Vessels fishing with gillnets may occasionally work in and near the Lease Area regardless of the target species. This activity is generally in the late Spring through early Fall (June-September) by vessels targeting species of opportunity.

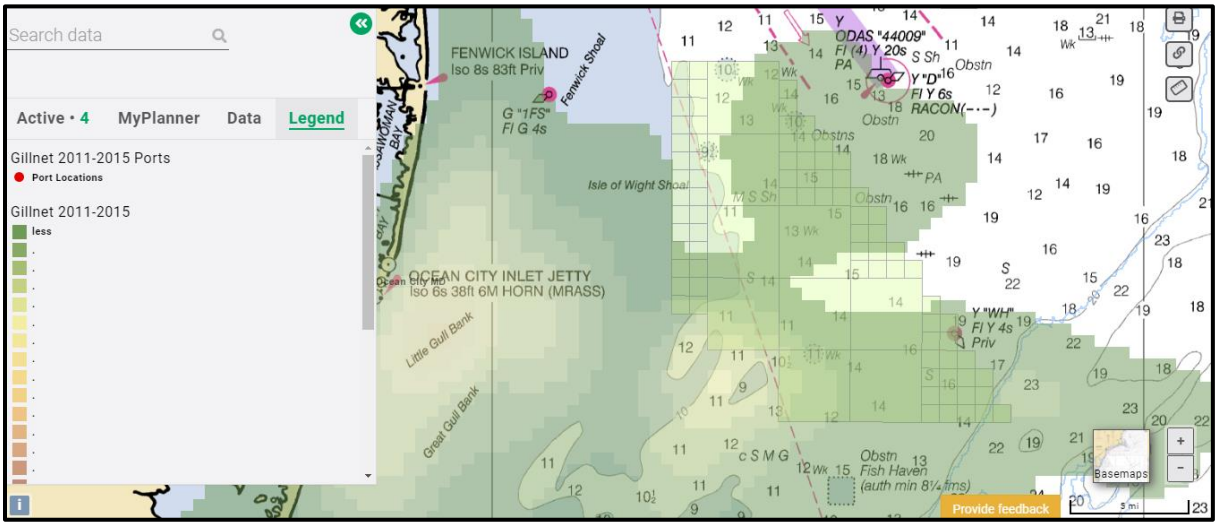

Figure 2.14: Heat map of gillnet fishing effort 2011 – 2015 (MARCO Data Portal); water depth is given in fathoms.

2.5 Surf Clam and Ocean Quahog Dredging

2.5.1 Fishery Description

The Ocean Quahog and Surf Clam fisheries are managed regionally as a single fishery by the Mid-Atlantic Fisheries Management Council (MAFMC). Harvests are regulated by an Individual Transferrable Quote (ITQ) program; harvest quotas are set annually. The total number of vessels participating in the fisheries has remained relatively stable in the recent decade (Table 2.1), with vessels shifting between harvesting surf clams and ocean quahogs.

Vessels (Excluding Maine)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Harvesting surf clams & ocean quahogs	8	12	12	13	7	7	6	8	14	8
Harvesting only surf clams	28	22	24	29	33	31	31	30	26	31
Harvesting only ocean quahogs	7	9	7	6	9	9	10	9	8	8
Total Vessels	43	43	43	48	49	47	47	47	48	47

Table 2.1: Total federal clam fleet profile, 2009 through 2018.

According to stock assessment and fisheries landing(s) data, neither species is considered 'overfished'. The total ex-vessel value of the 2018 federal surf clam harvest was approximately $30 million, the 2018 federal ocean quahog ex-vessel value was $24 million. In 2018, there were six (6) companies reporting purchases of surf clams and/or ocean quahogs in four (4) states outside of Maine. There are occasional landings in Ocean City, MD; most of the fleet is fishing out of Pt. Pleasant, Cape May and Atlantic City, NJ, Oceanview, NY, Hyannis, MA (surf clams only), and New Bedford and Fairhaven, MA.

Year over year, for the past decade, there has been very little change in the volume and value landings and the numbers of vessels and dealers participating in this fishery. It should be noted that the landings per unit effort continues to decline, meaning more cost to the vessel and more dredge time on the seabed.

The clam fishery appears to continue shifting its effort northward, with increased landings in recent years from Southern New England and Georges Bank areas. This effort, however, may be redistributed due to the recent closures of fishing areas on Nantucket Shoals. An April 2021 meeting of the Mid-Atlantic Fisheries Management Council Surf Clam Ocean Quahog (SCOQ) Advisory Panel, made up of commercial fishermen and researchers, noted that there has been little, if any, fishing effort in the Delmarva region the prior year and that the fishery in this area is no longer commercially viable. Test tows may still be made on occasion in the Lease Area so planning should consider that surf clam dredging operations may still take place.

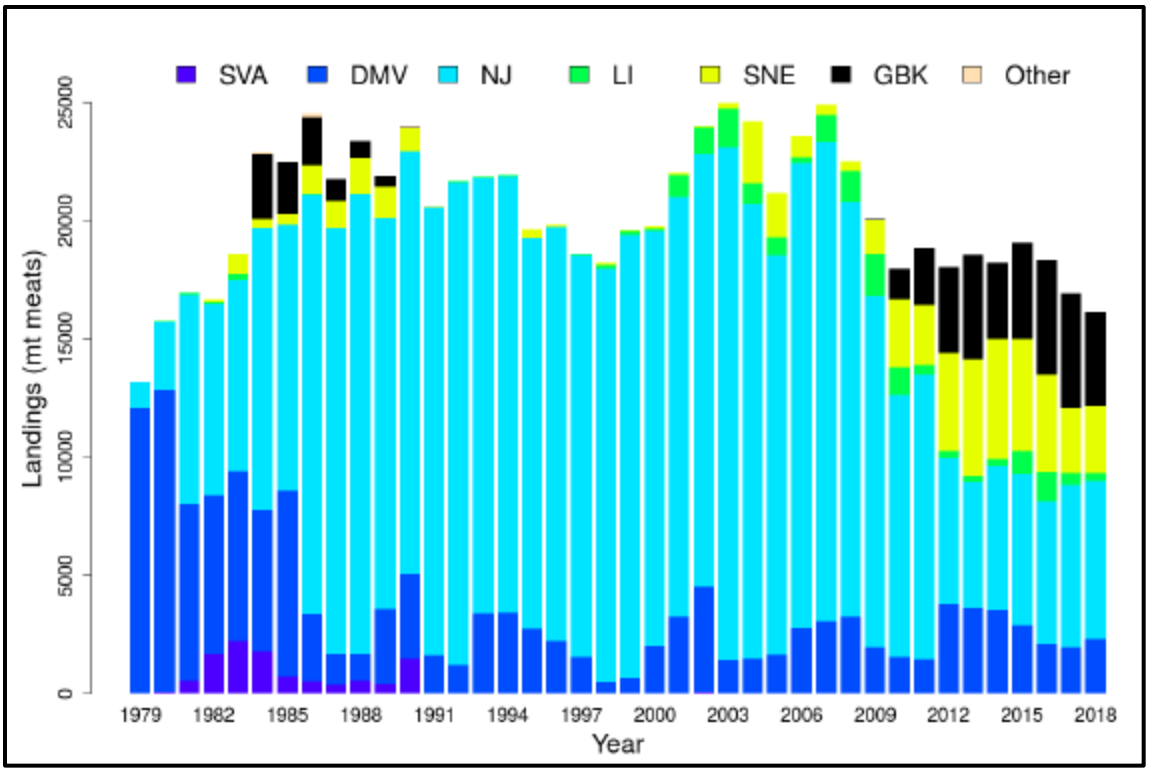

Figure 2.15: Surf clam landings from the US EEZ during 1979-2017, and preliminary 2018.

2.5.2 Habitat Description

Surf clams and ocean quahogs occupy the top three (3) feet (~1m) of seabed, typically in fine-medium grained sands; surf clams will not burrow into mud substrate while ocean quahogs will. Although the habitat of the different species overlaps, commercial concentrations have historically been separated by depth and water temperature.

Surf clams inhabit waters from the surf zone to a water depth of about 200' (~60m), although abundance beyond 125' (~38m) is low. Ocean quahogs are among the longest-lived and slowest growing of marine bivalves and may reach a maximum age of 225 years. They are found in depths from 30' to 800' (~10m – 250m), most are found at depths of 82'-200' (~25m – 60m); highest densities in the mid-Atlantic region are between 130' and 200' (40m – 60m). The (inshore) state waters of Maryland have no essential habitat for ocean quahogs, however there is a concerted fishery for them east of the Lease Area, and clam dredge vessels frequently transit the Lease Area from Ocean City and from ports in New Jersey.

The distribution of surf clams off the Maryland coast has largely shifted offshore, into ocean quahog habitat, over the last two decades, but from AIS observations it appears that a very small amount of effort has occurred in the central part of the Lease Area in 2019-2020, possibly as test tows.

2.5.3 Gear Description

Atlantic surf clam and ocean quahog fisheries utilize hydraulic dredges/water jets to pump ~3,000-9,000 gal/min into the seabed to soften and remove sediment as well as the clams within it. Dredges have blade/knife widths as wide as 12' (4m) and may weigh ~20,000 lbs. (~10 tons). Vessels vary in size (60' – 160') and horsepower (<1,000+ hp) and may tow two (2) dredges at a time. Although the blade rides only a few inches below the skids at seabed level, the dredge liquifies and removes some sediment with each pass. Vessels sometimes make many tows in a small area, and passes over the same area may have cumulative impact. They are reported to penetrate more than three feet with cumulative impacts of intensive fishing in small areas, but this is atypical, and given the lack of clam fishing activity in the Lease Area, clam dredging is not expected to have an impact or be impacted. Tow speeds are typically between 3-4 knots, although speeds may vary based on weather, sea state, tide, and catch rate. The figures below are representative of the vessels and gear currently in use.

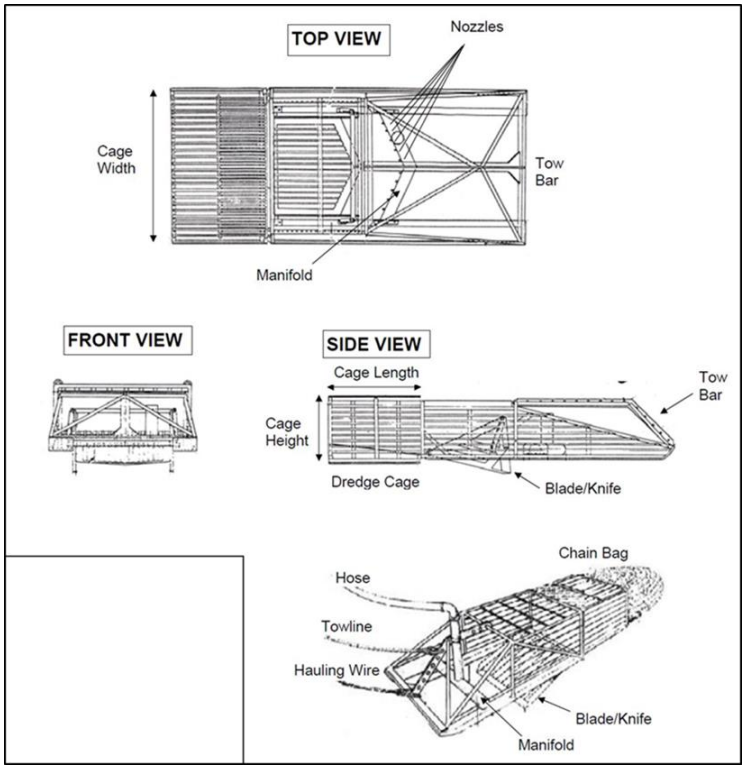

Figure 2.16: Schematic of hydraulic clam dredge design

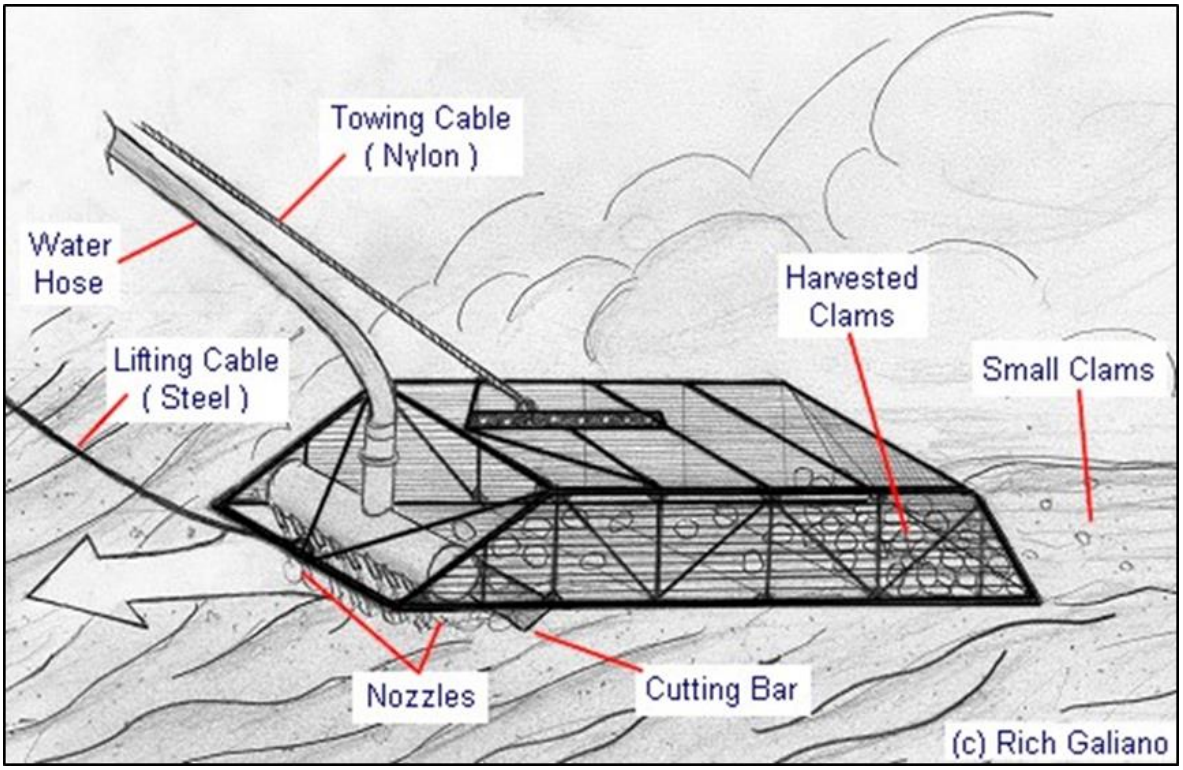

Figure 2.17: Example of hydraulic clam dredge design

Figure 2.18 Hydraulic clam dredge fishing vessel in operation

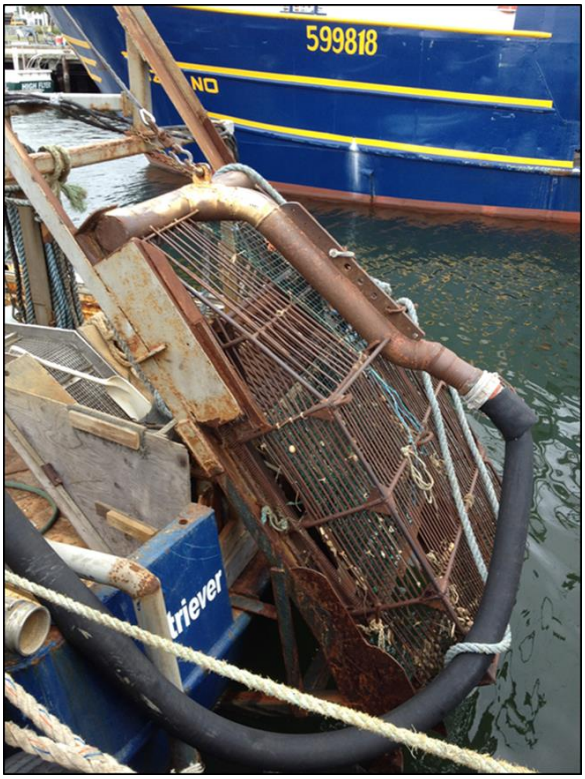

Figure 2.19: Hydraulic clam dredge before deployment

2.5.4 Fishing Effort - Lease Area

Apart from the minimal effort observed recently inside the US Wind Lease Area assumed to be targeting surf clams, the primary commercial clam dredge fishery is conducted outside the Lease Area, targeting ocean quahogs in the deeper, cooler offshore waters. Maximum depth within the Lease Area is in the very southeastern portion, about 135' (~41m); most of the Lease Area is generally less than 90' (27m) water depth. While surf clam fishing has been historically conducted throughout the Lease Area, as mentioned above, due to several factors including changing environmental conditions and historic fishing pressure, effort has been shifting north and east into cooler and deeper waters.

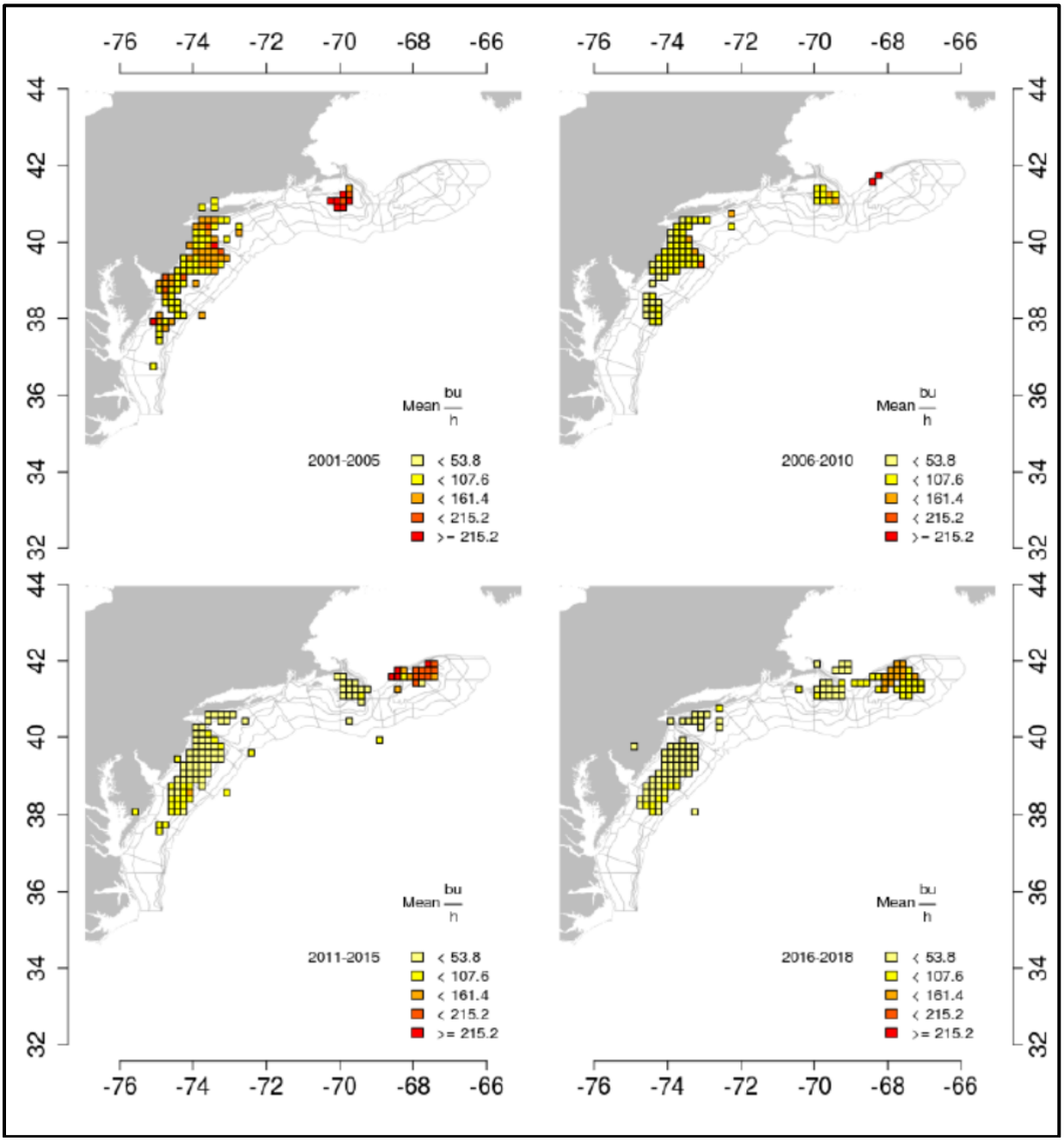

Figure 2.20: Average ***surf clam*** landings per unit effort (LPUE; bu. h-1) by ten-minute squares over time, 2001-2016 and preliminary 2017. Only squares where more than 5 kilo bushels were caught are shown.

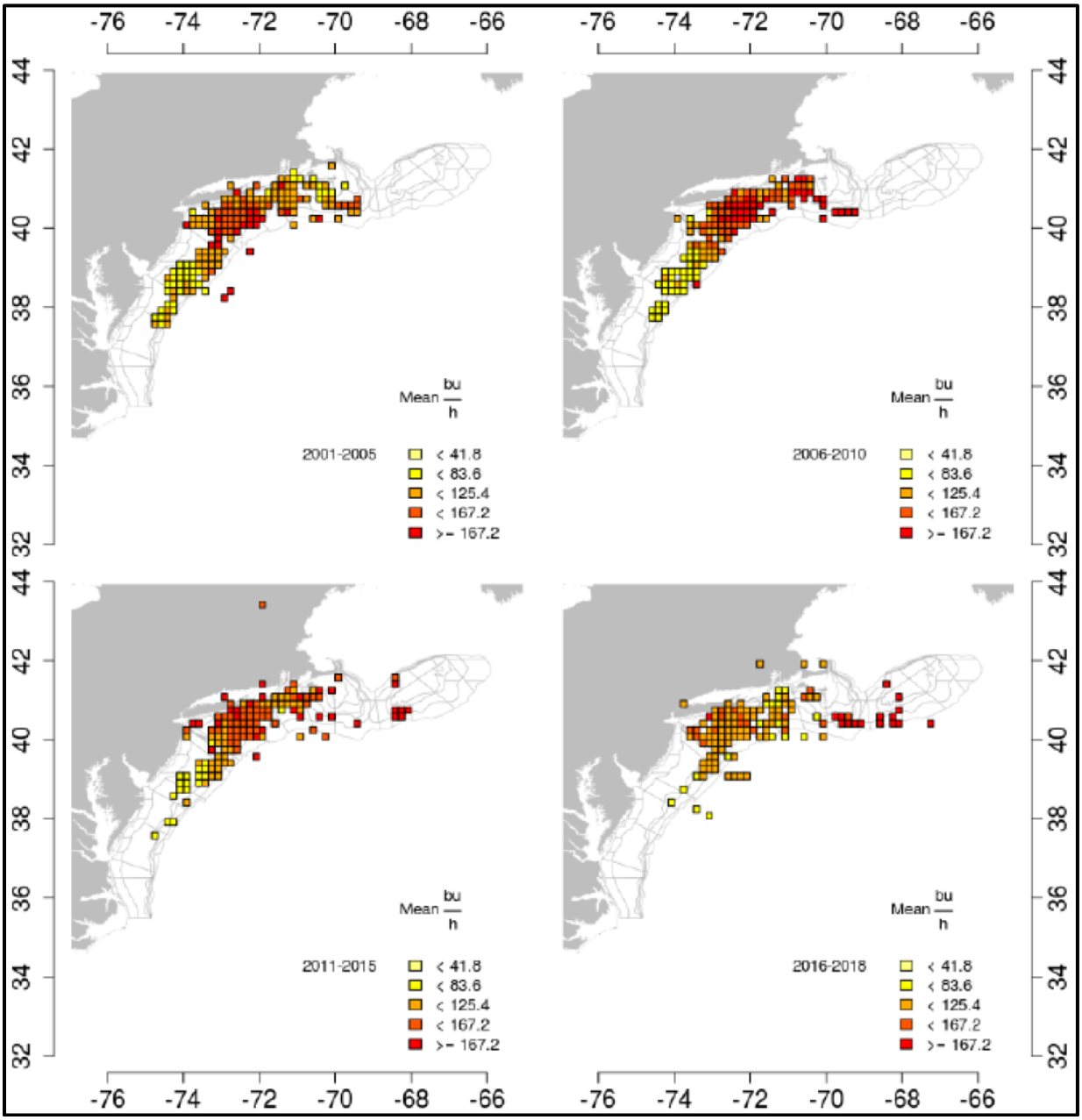

Figure 2.21: Average ***ocean quahog*** landings per unit effort (LPUE; bu. h-1) by ten-minute squares over time, 2001-2016 and preliminary 2017. Only squares where more than 5 kilo bushels were caught are shown.

It should be noted that, given the slow growing nature of the species and the existence of suitable habitat throughout the Lease Area, any shift in fishing activity may only be temporary. A year class of clams could settle in an area currently supporting low fishing effort, only to be heavily fished in future years once clams reach a harvestable size.

Although very little, if any, commercial clam dredge activity exists inshore of the Lease Area, the external aggression risk from this fishery must be considered when planning burial of the export cable route(s) to shore. In addition to the commercial fishery, there are also state and federal surveys that are carried out with commercial gear; these activities should also be considered.

2.5.5 Use within Lease Area

As in all fisheries, fishing styles will vary and are influenced by captain preference/experience, catch rate, water depth, seabed type, weather, etc. There appear to be 'typical' patterns observed in the AIS data but there are outliers as well, which are likely influenced by conditions experienced at the time or by a captain's decision. An example of a captain's decision may be to 'explore' an area to identify a new area of production.

What is clear from the AIS data is that fishermen can, and routinely do, make multiple tows safely and effectively in very narrow swaths of seabed. Fishermen are skilled at controlling gear placement on the seabed; tows can be made alongside and/or between known seabed obstructions. Vessels typically tow at ~3.0 to 4.0 knots for about an hour, durations can vary based on catch rate. Fishermen may tow through a turn, with a turning circle typically less than 0.3 nautical miles or retrieve gear and turn sharply.

While clam fishermen have stated on several occasions that turbine spacing of no less than 2.0 nautical miles is needed to fish safely and effectively, data supported by scale drawings of a typical vessel (Figure 2.22) and AIS tracks from actual vessels engaged in the fishery indicate a reduced spacing could be supported. A typical footprint for clam dredge fishermen making multiple tows, is approximately 2.0 – 2.5 nautical miles in length and 0.3 – 0.5 nautical miles wide. However a great variety of diverse footprints have been noted as well.

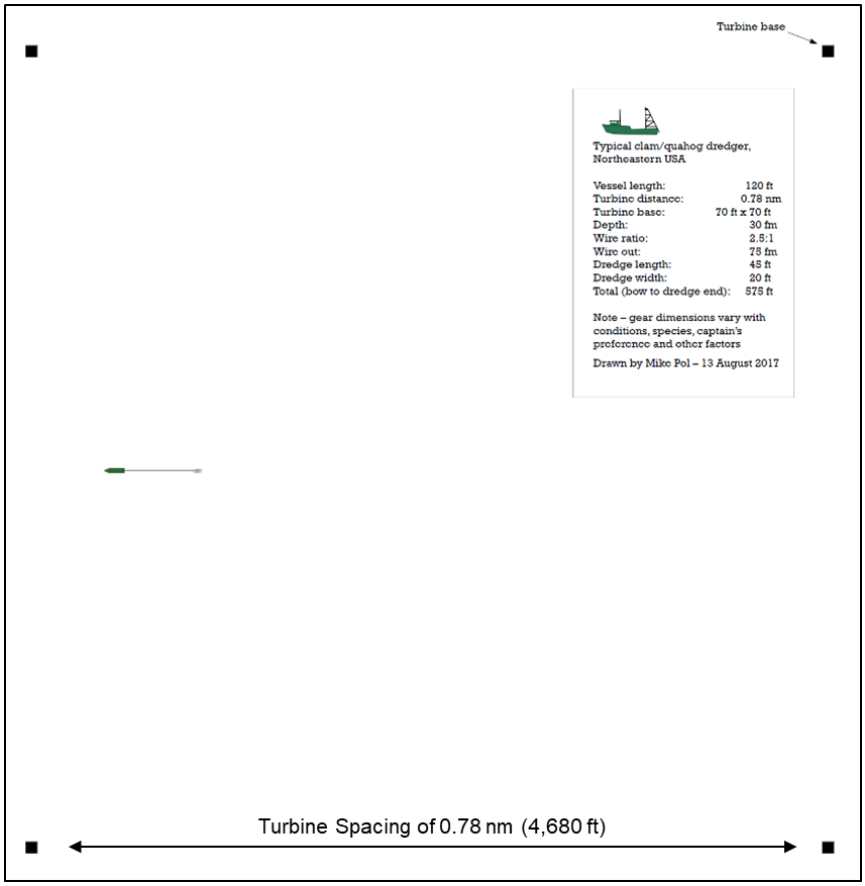

Figure 2.22 Scale drawing represents 120' surf clam/ocean quahog dredge vessel working a depth of ~180' (~55m) within turbines at 0.78 nm spacing; drawing represents turbine base of 70' x 70'. (Source: NYSERDA Offshore Wind Master Plan 2017).

2.6 Scallop Dredging

2.6.1 Fishery Description

The Atlantic sea scallop is one of the most economically important species in the northeast United States and supports the most valuable wild scallop fishery in the world, landing 60.6 million pounds valued at approximately $570 million in 2019. Fishery management is conducted by a combination of days at sea (DAS) allocation, a system of rotational area closures, and limited entry into the fishery. The fishery is conducted mainly by about 350 vessels with limited access permits and two types of allocations are given to each limited access vessel. The first is a number of trips to rotational access areas that had been closed to scallop fishing in the past (with a trip limit, typically 12,000-18,000 lbs. or 5,443-8,165 kg meats). The second is days at sea (DAS), which can be used in areas outside the closed and access areas. Vessels fishing under DAS allocations are restricted to a seven (7) person crew and must shuck their scallops at sea in order to limit their processing power.

The remainder of landings come from vessels operating under "General Category'' permits that are currently restricted to 272 kg meats (600 lbs.) per trip, with a maximum of one trip per day. Vessels in the General Category fleet are each allocated a yearly quota and a number of fleetwide trips into scallop access areas. Landings from these vessels were less than 1% of total landings in the late 1990s, but increased to about 10% of landings during 2007-2009, and currently constitute about 6-7% of total landings. This type of permit had been open access but was converted to an individual transferable quota (ITQ) fishery in March 2010.

Principal ports in the sea scallop fishery are New Bedford, MA, Cape May, NJ, and Hampton Roads and Newport News, VA, but lesser amounts of scallops are landed in many ports from North Carolina to Maine. While historically significant, there is currently little scallop fishing off Maryland.

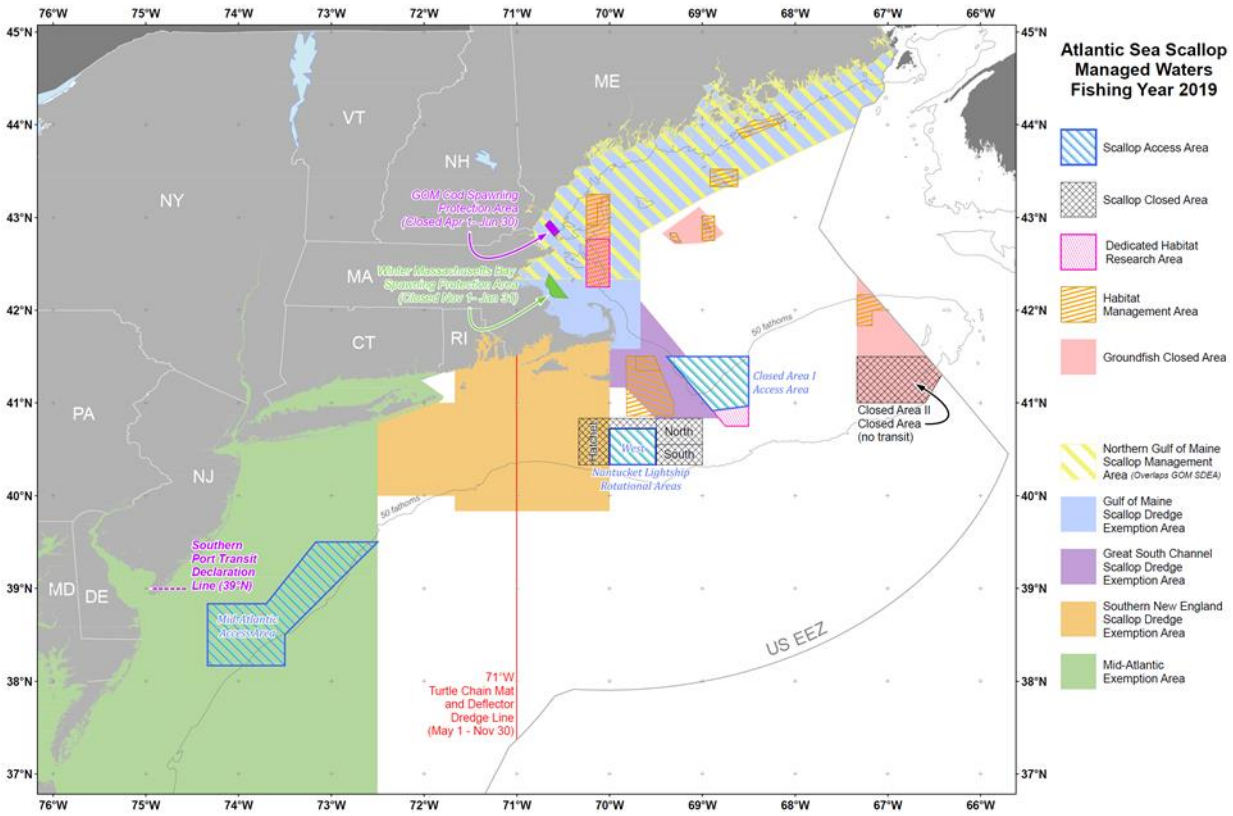

Figure 2.23: Atlantic sea scallop management areas.

2.6.2 Habitat Description

Atlantic sea scallops typically occur in seabed areas with firm sand, gravel, shells, and cobble substrate at depths ranging from ~60'-350' (~18-110 m). In the Mid-Atlantic Bight, largest concentrations from Hudson Canyon south to the area off Delaware Bay are found at depths of ~90'- 265' (~27-80 m), the average depth is ~180' (~55 m). Atlantic sea scallops are not sessile organisms, they will swim to escape predation and disturbances such as fishing. While swimming, young scallops can be carried long distances by currents. There is no evidence of mass migrations by scallops, movements are usually localized, and random or current-assisted. There is very little, if any prime scallop habitat, by depth and substrate, in the Lease Area.

2.6.3 Gear Description

Toothless offshore (New Bedford style) scallop dredges are the main gear type used in all regions (Figure 2.23), they operate 'mechanically' with no water jet assistance as in the clam dredge. A typical limited access vessel tows two 13'-15' (~4.0-4.6 m) dredges, but some limited access vessels are restricted to a single 10.5' (~3.2 m) dredge, and most general category vessels also use a single smaller dredge.

Dredge size will vary by vessel size and, as noted above, by permit category. Depending on size and rigging of the dredge, it can weigh ~1,500 lbs. Since the scallops do not burrow into the substrate, the dredges are not designed to dig into the seabed and will penetrate ~8" (~20cm) at the 'shoes' depending on seabed conditions.

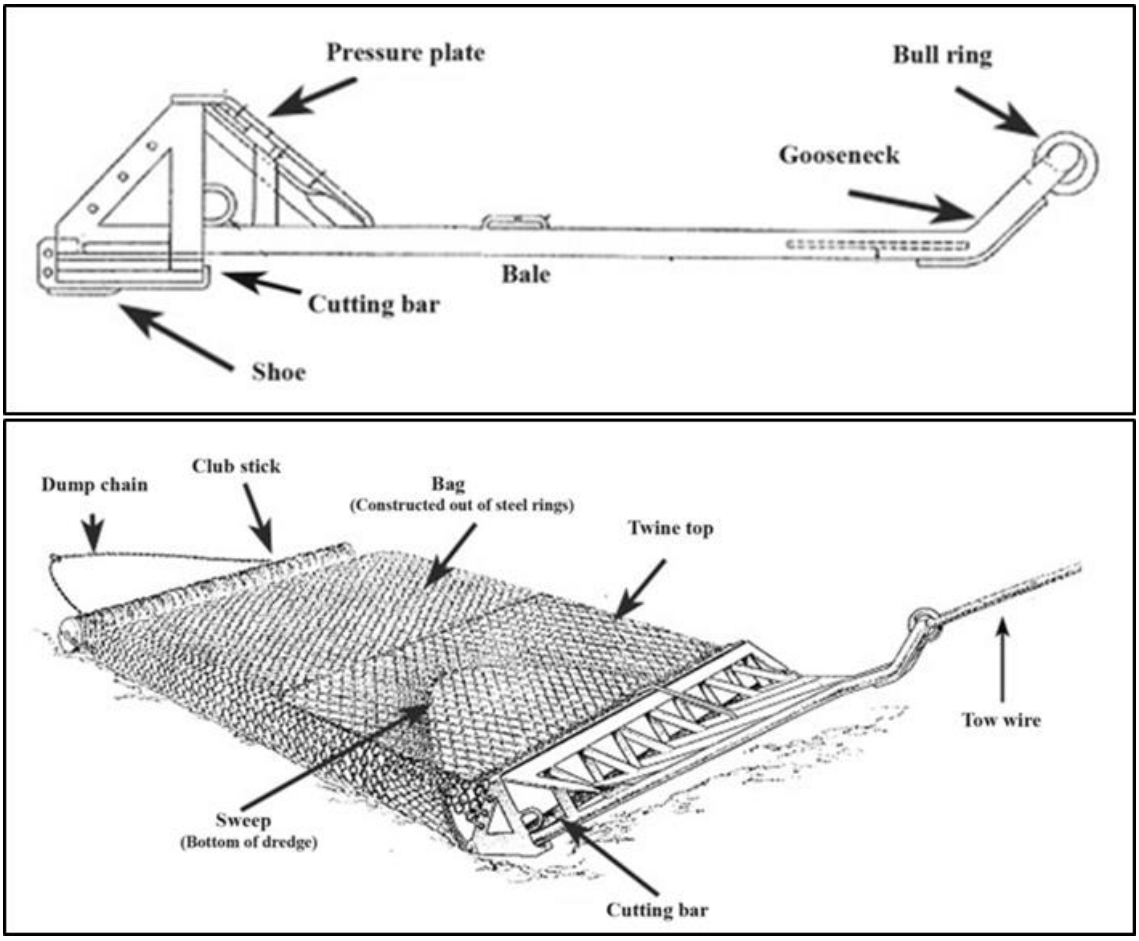

Figure 2.24: Typical design for a New Bedford style sea scallop dredge

Figure 2.25: Scallop dredges suspended on the deck of the vessel; chain mesh is designed to keep rocks/boulders from entering the dredge.

Figure 2.26: Example of a day boat scallop vessel working a single dredge

2.6.4 Fishing Effort - Lease Area and Export Cable Routes

Sea scallop harvests in the Mid-Atlantic Bight area occur primarily at depths of ~90'-330' (~30 to 100 m). There is very little suitable habitat to support commercial harvest of Atlantic sea scallops within the Lease Area and therefore there is very little fishing effort. When reviewing the fishing effort heat map displayed in Figure 2.27 below, it is important to note that the activity displayed in the central portion of the Lease Area is likely an artifact scallop vessels transiting the area to/from Ocean City. A directed scallop fishery is not observed within the Lease Area. Although not observed, it is possible that small-scale, opportunistic day-boat fishing could occasionally take place within the Lease Area. Some of these small-scale vessels were noted on a visit to Ocean City in May 2021; it is expected that these vessels transit through the Lease Area to offshore scallop grounds.

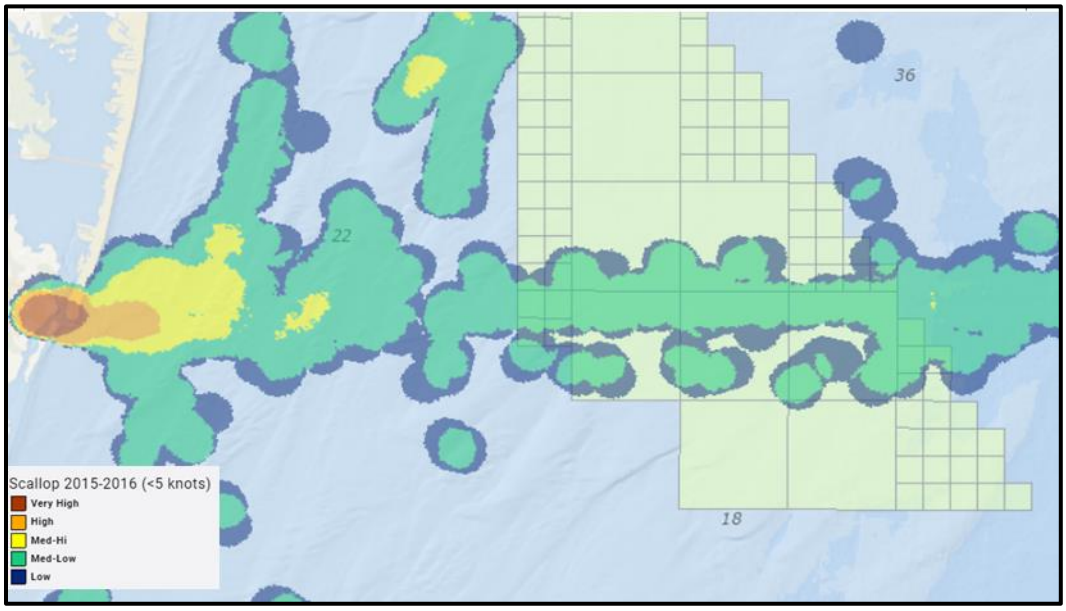

Figure 2.27: Heat map of scallop fishing effort near the Lease Area from 2015 – 2016 (MARCO Data Portal); effort likely indicates scallop vessels transiting the area or slowing to complete processing of scallops, rather than actual fishing. Water depth is given in fathoms.

2.6.5 Use within Lease Area

As previously noted, directed sea scallop fishery has not been observed within the Lease Area. For completeness of this assessment, a description of fishing styles, AIS fishing tracks outside the Lease Area and scale drawings of vessels within a turbine array are included. As in all fisheries, fishing styles will vary and are influenced by captain preference/experience, catch rate, water depth, seabed type, weather, etc. There appear to be 'typical' patterns observed in the AIS data but there are outliers as well, which are likely influenced by conditions experienced at the time or a captain's decision.

What is clear from the AIS data is that fishermen can, and routinely do, make multiple tows safely and effectively in very narrow swaths of seabed. Fishermen are skilled at controlling gear placement on the seabed; tows can be made alongside and/or between known seabed obstructions. Vessels typically tow at ~4.5 to 5.5 knots for less than one (1) hour, but durations can vary based on catch rate. Fishermen may tow through a turn, with a turning circle that may be less than 0.3 nautical miles, or retrieve gear and turn sharply. Fishermen generally prefer to tow along consistent depth contour.

Typical footprints for scallop dredge fishing have been observed on AIS working outside the Lease Area, making multiple tows within a footprint of approximately 3.0 – 4.0 nautical miles long and 0.3 – 0.5 nautical miles wide. Other footprints reflect straight tows, where a vessel would drift for a period of time after retrieving the gear. A scale drawing of a typical scallop vessel within turbine array of nominal 0.78 nm spacing is shown in Figure 2.28 below.

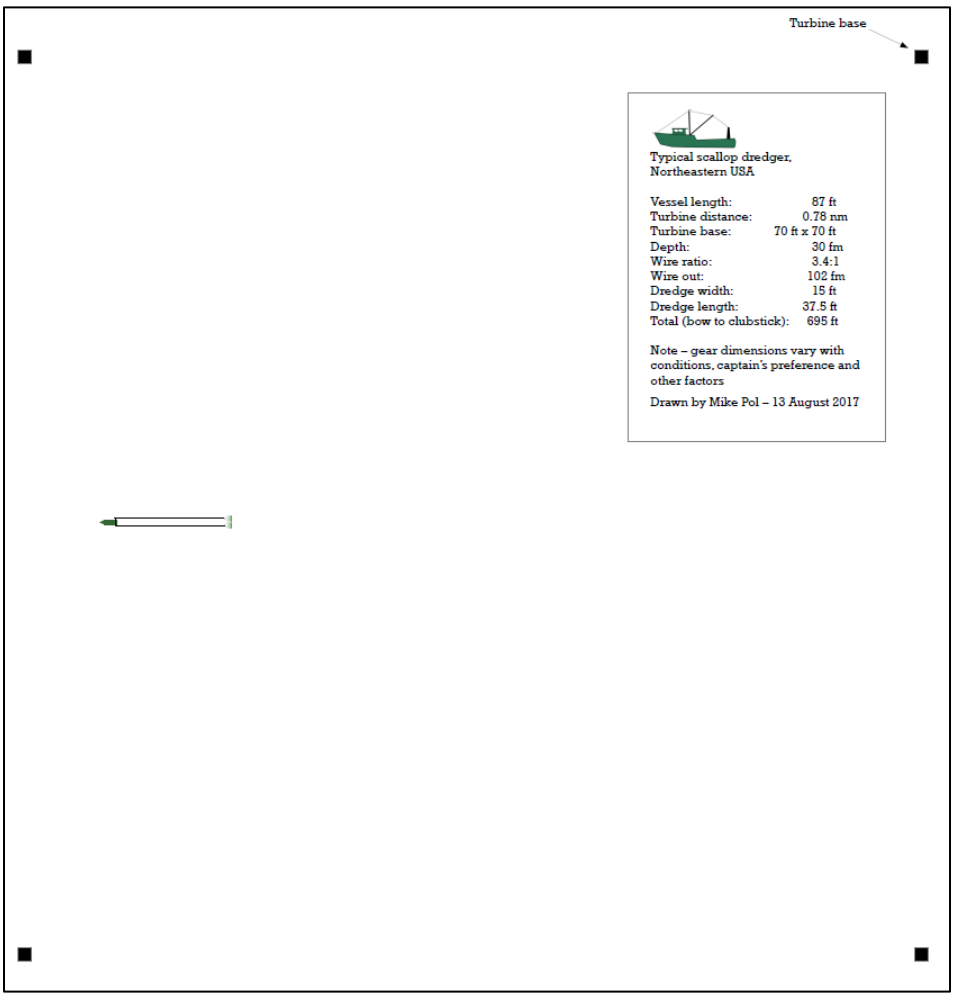

Figure 2.28: Scale drawing represents 87' scallop dredge vessel working a depth of ~180' (~55m) within turbines at 0.78 nm spacing; drawing represents turbine base of 70' x 70'. (Source: NYSERDA Offshore Wind Master Plan 2017)

2.7 Other - Commercial

2.7.1 Pelagic Longline Fleet

Ocean City, Maryland and to a greater extent, the New Jersey ports of Cape May, Barnegat Light, and Point Pleasant, and coastal fishing ports in Virginia support resident and transient fleets of vessels that use floating longlines to target large pelagic species (e.g. tuna, swordfish, mahi mahi, etc.). There is no gear interaction within the Lease Area since these fisheries take place well offshore. However, as the target species migrate seasonally and the fishing grounds shift, vessel transit paths to the fishing areas will shift as well.

2.7.2 Purse Seine Fisheries

On occasion, vessels may target schooling bait fish such as menhaden. Vessels may use spotter planes to identify schools of fish to target. There is only anecdotal information that this fishery could take place from time to time within the Lease Area. Figure 2.29 below may be indicative of purse seining, which is conducted for pelagic species.

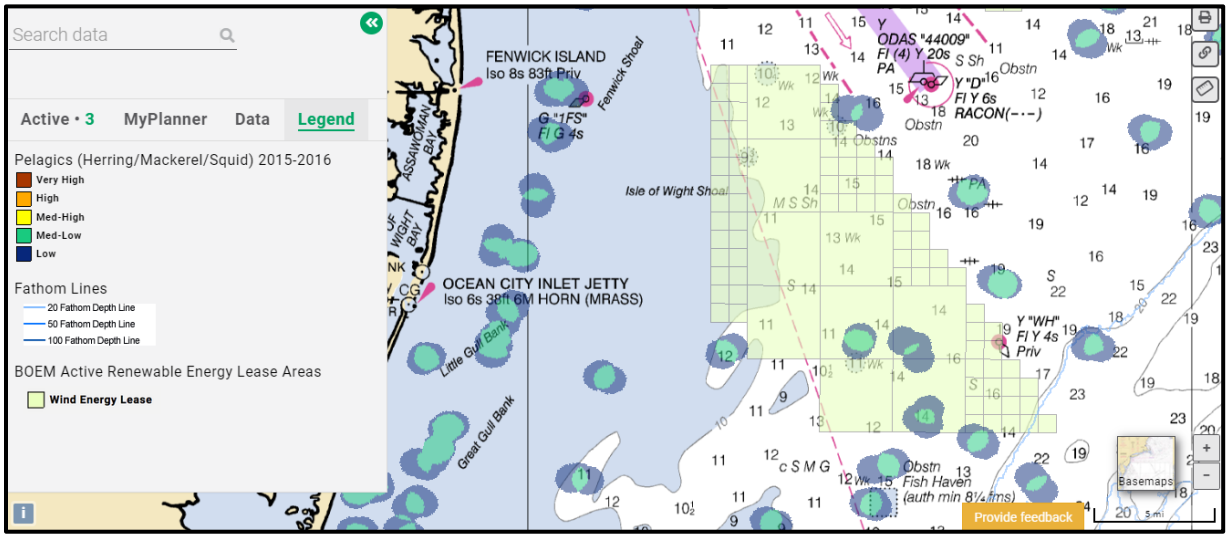

Figure 2.29: Pelagic fishing activity 2015-2016 (MARCO Data Portal).

3 Commercial Fishing Revenue

Information presented in this section is taken from the NOAA/NMFS/GARFO Data Download Website and the BOEM Renewable Energy GIS Data site. Data presented on both sites are products of the National Marine Fisheries Service Northeast Fisheries Science Center (NEFSC). Note that the NOAA/NMFS/GARFO treated the US Wind Lease Area as two (2) separate areas identified as US WIND 1 and US Wind 2; some of the figures below are laid out accordingly.

In general terms, the US Wind Lease Area could be considered 'lightly fished" with the annual revenue derived by commercial fishermen from the Lease Area averaging less than $220,000/year. While this value may be considered very low, this revenue is critical to the business model of those few fishermen who derive important portions of their annual incomes from the Lease Area.

3.1 Revenue by Species

The average annual revenue derived from the Lease Area over the last 12-years is approximately $217,583 (**Table 3.1)** with no single year exceeding a value of $400k or falling below $100k. When excluding the revenue outlier years of 2009 (high) and 2019 (low); the average annual revenue derived from the area remains at approximately $210,000. Note that the years with higher landings (e.g., 2008, 2010, and 2013) do not correspond with higher revenue due to the high volumes of low value fish caught in those years (e.g., Menhaden). Conversely, the highest value year (2009) represents the 2nd lowest volume of landings (180,000 Lbs.), which corresponds to an increase in reported sea scallop landings, a high value species (**Figure 3.1)**.

Year	Revenue ($)	Landings (Lbs.)
2008	$279,000	452,000
2009 (high)	$393,000	180,000
2010	$256,000	664,000
2011	$200,000	254,000
2012	$163,000	304,000
2013	$148,000	439,000
2014	$173,000	298,000
2015	$271,000	202,000
2016	$256,000	264,000
2017	$145,000	280,000
2018	$209,000	361,000
2019 (low)	$118,000	93,000
12-yr AVG	**$217,583**	**315,917**

Table 3.1: Revenue and landings from within the Lease Area 2008-2019, US Wind 1 and US Wind 2 combined, rounded to the nearest 1,000. *Source: National Oceanic and Atmospheric Administration (NOAA) Greater Atlantic Regional Fisheries Office 2020*

Figure 3.1: Top species (annual revenue) in the US Wind 1 (A) and US Wind 2 (B) Lease Areas. *Source: National Oceanic and Atmospheric Administration (NOAA) Greater Atlantic Regional Fisheries Office 2020*

All species landed from the Lease Area, by revenue and pounds landed, for the 12 years spanning 2008-2019 are given in **Table 3.2** below. When excluding the "All Others" category, which is a combination of species of lesser landings not represented in the table, the five species with the highest valued landings deriving from the Lease Area are given as sea scallop, whelk (sp.), summer flounder, surf clam, and black sea bass.

It is important to note that the data as presented represents information reported by fishermen regarding area fished, which may contain some errors. For example, the data shows a significant volume of Illex squid, almost 100,000 lbs., were reported landed from the Lease

Area. However, Illex squid are most frequently caught along the shelf break waters in depths of 492 to 902 feet (ft) (150 to 275 meters [m]) (NMFS 2020), and their appearance here could be an error in reporting the statistical area fished or a circumstance where data outside of the Lease Area might be lumped within the Lease Area data, based on a variance of VTR location data where the vessel fished during a given trip.

Species	12-Year Revenue ($)	Annual Revenue Avg ($)	12-Year Landings (Lbs.)	Annual Landings Avg (Lbs.)
Sea Scallop	$869,501	$72,458	107,418	8,952
Whelk (Sp.)	$284,119	$23,677	42,947	3,579
All Others	$224,356	$18,696	267,066	22,256
Summer Flounder	$211,209	$17,601	98,998	8,250
Surf Clam	$175,246	$14,604	272,431	22,703
Black Sea Bass	$169,040	$14,087	60,713	5,059
Spiny Dogfish	$144,951	$12,079	826,605	68,884
Menhaden	$105,494	$8,791	1,603,061	133,588
Squid (Loligo)	$75,560	$6,297	64,742	5,395
American Lobster	$72,785	$6,065	14,874	1,240
Horseshoe Crab	$66,297	$5,525	55,021	4,585
Smooth Dogfish	$51,159	$4,263	68,807	5,734
Squid (Illex)	$44,675	$3,723	92,459	7,705
Atlantic Croaker	$41,360	$3,447	73,116	6,093
Monkfish	$19,872	$1,656	13,862	1,155
Bluefish	$18,051	$1,504	29,417	2,451
Skate (Sp.)	$15,809	$1,317	60,224	5,019
Totals	**$2,589,484**	**$215,790**	**3,751,761**	**312,647**

Table 3-2 Species Landed from within the Lease Area 2008-2019; US Wind 1 and US Wind 2 combined. *Source: National Oceanic and Atmospheric Administration (NOAA) Greater Atlantic Regional Fisheries Office 2020*

3.1.1. Sea Scallop

Although sea scallops represent the highest historical revenue on average ($72,458 annually) derived from the Lease Area, generating more than three times the revenue of the next closest species complex (whelk), they only represent a small portion of the landings from the Area. As per the revenue raster images in **Figure 3.2**, the sea scallop fishery revenue derived from the Lease Area is declining in recent years. VTR fishing activity assigned to the Lease Area is largely transit-related, and not representative of actual fishing activity in the Area.

3.1.2. Whelk Species

The species of whelk harvested from the Area are primarily Channeled Whelk, although Knobbed Whelk are taken as well. Making up the 2nd highest revenue producer for the Lease Area (about $23,677 annually reported), the fishery is not federally managed and the data on the fishery may suffer for that reason. Considering that the landings/revenue start showing up significantly in the data from 2014-2019, the average annual revenue generated from the whelk fishery may be closer to $50,000 per year. This is also reflected in the revenue raster images

where Panel A in **Figure 3.3** shows essentially non-existent revenue reported from 2007-2012, while **Figure 3.4** shows the recent history of unmanaged species revenue, which would include Whelk (sp.).

3.1.3. Summer Flounder

Summer Flounder represents the third most valuable species when considering revenue derived from the Lease Area, with an average annual revenue of $17,601. Historically (2007-2012) there was significant revenue derived from the Lease Area, as shown Panel B of **Figure 3.3**. However, from 2016-2018 there was little revenue derived from the Black Sea Bass, Summer Flounder, and Scup species complex in the Lease Area (Panels B, C & D in **Figure 3.5**), the revenue that does exist is suspected to be related to the directed Black Sea Bass pot fishery.

3.1.4. Surf Clam

Once a prominent fishery in the waters off Virginia and Maryland, there has been very little revenue generated from the Lease Area in the last twelve (12) years as shifts in average ocean temperature and plankton availability has resulted in a northward truncation of the species range. The average annual revenue from 2008 – 2019 was $14,604, with landings revenue as recently as 2018 from the southeast portion of the Lease Area (**Figure 3.6**).

3.1.5. Black Sea Bass

Black sea bass is likely the primary commercial fishery within the Lease Area in terms of regular presence of fishing gear, even though it barely breaks the top-5 in terms of revenue generated ($14,087 annually at last assessment). It should be noted that there are revenue 'hot-spots' just east of the Lease Area (Panels B, C & D in **Figure 3.5**), not considered within the boundary of the Lease Area, that may be impacted. Certain depth depressions within the Lease Area are targeted after the early Spring and into Summer months by local black sea bass fishermen (WR personal communications and survey vessel observations, 2021), but these are not a significant revenue source in comparison to the deeper waters along the southern and eastern boundaries of the Lease Area. According to local fishers consulted during the US Wind sonar/benthic survey period in 2021, it has been a highly productive period for the fishery.

3.1.6. Horseshoe Crab

Rounding out the top-10 revenue-generating species from the Lease Area is the Horseshoe Crab. Given that the Lease Area overlaps a portion of the Carl N. Shuster Horseshoe Crab Reserve and that there is a dedicated horseshoe crab trawl fishery out of Ocean City, MD, it is important to mention it here. It is understood that it is illegal to harvest horseshoe crabs from within the Reserve and any harvest would be limited to the Lease Area not covered by the Reserve. For the 12-year period from 2008-2019 the annual revenue generated from horseshoe crab harvest within the Lease Area is $5,525. Horseshoe Crab revenue raster data is included within the Unmanaged Species in **Figure 3.4.** Note that the Horseshoe Crab harvest is expected to take place closer to shore, with very little targeted effort within the Lease Area.

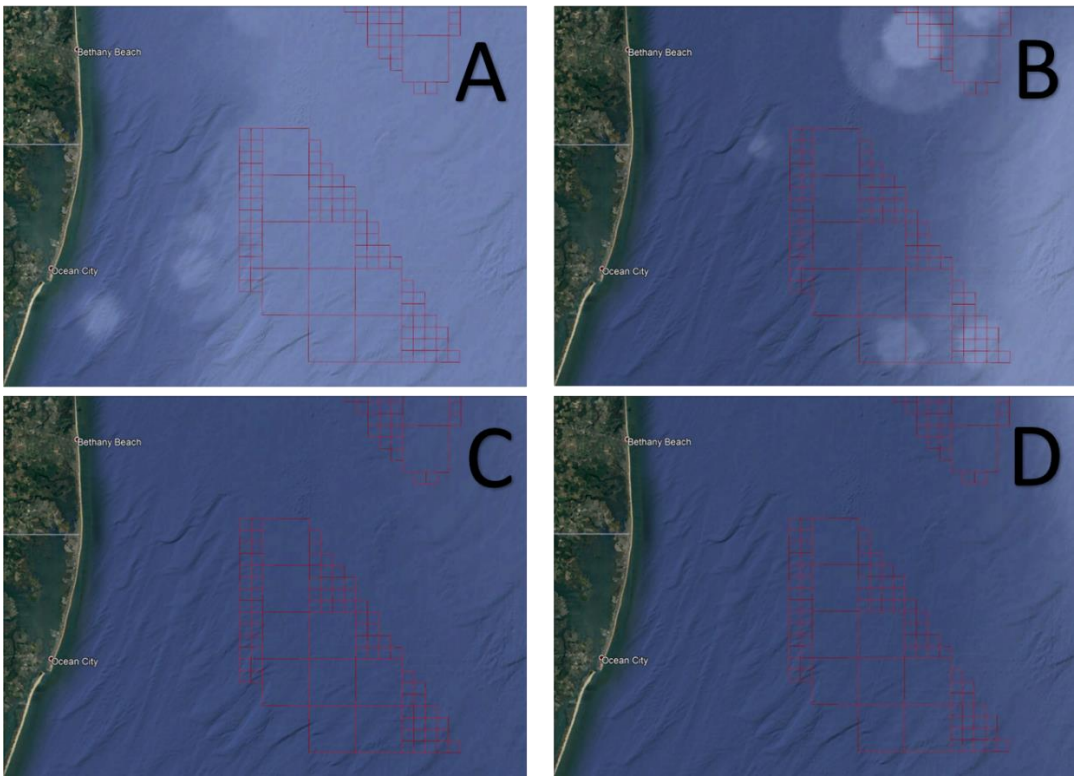

Figure 3.2: Sea Scallop revenue showing bulk 6-year history from 2007 – 2012 in panel (A), then recent single year revenues from 2016 (B), 2017 (C), and 2018 (D).

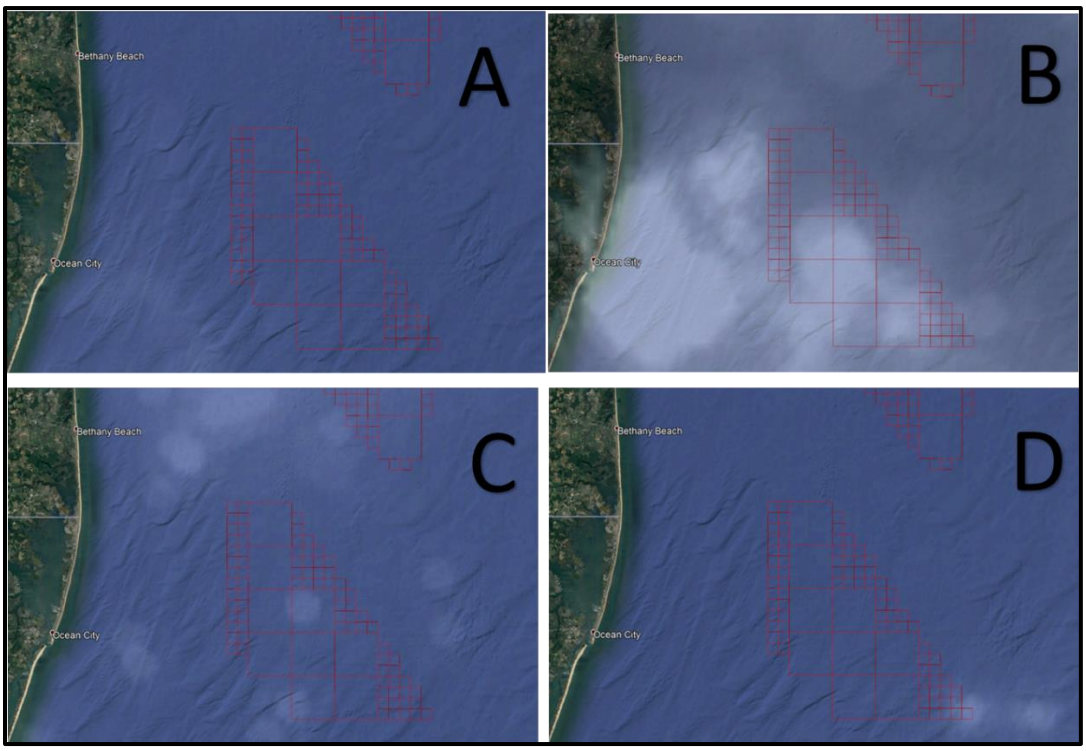

Figure 3.3: Revenue showing bulk 6-year history from 2007 – 2012 for Channeled Whelk (A), Summer Flounder (B), Menhaden (C), and Monkfish (D).

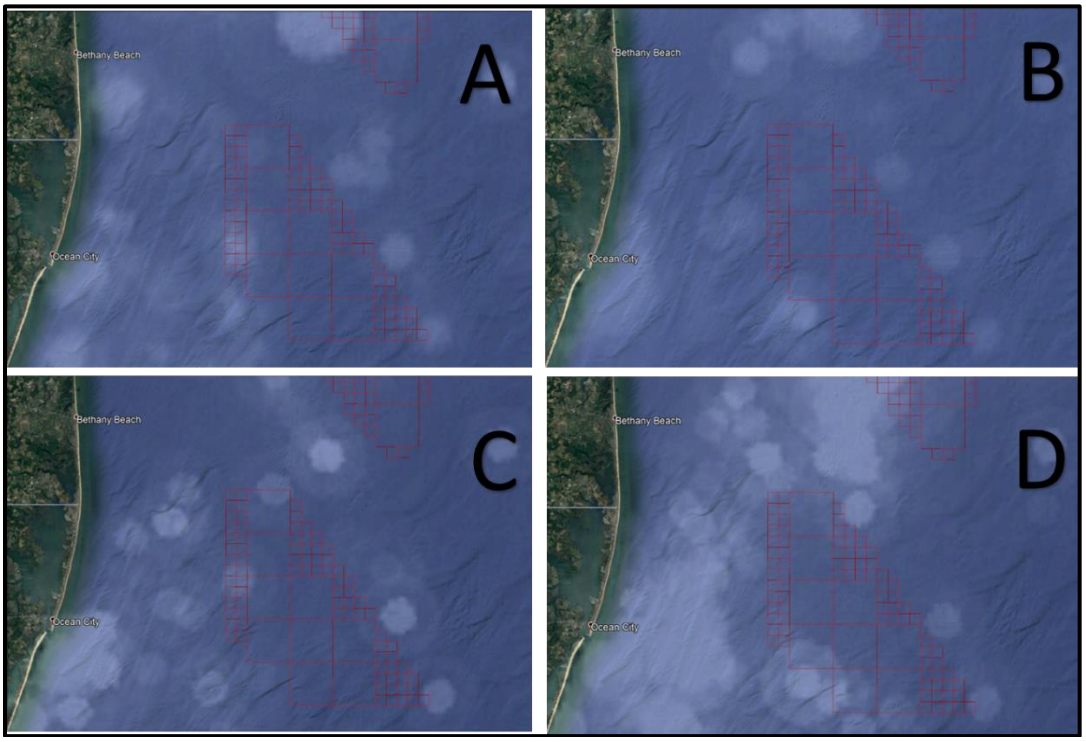

Figure 3.4: Unmanaged Species annual revenue from 2015 (A), 2016 (B), 2017 (C), and 2018 (D). Species include Horseshoe Crab and Whelk (Sp.) among others.

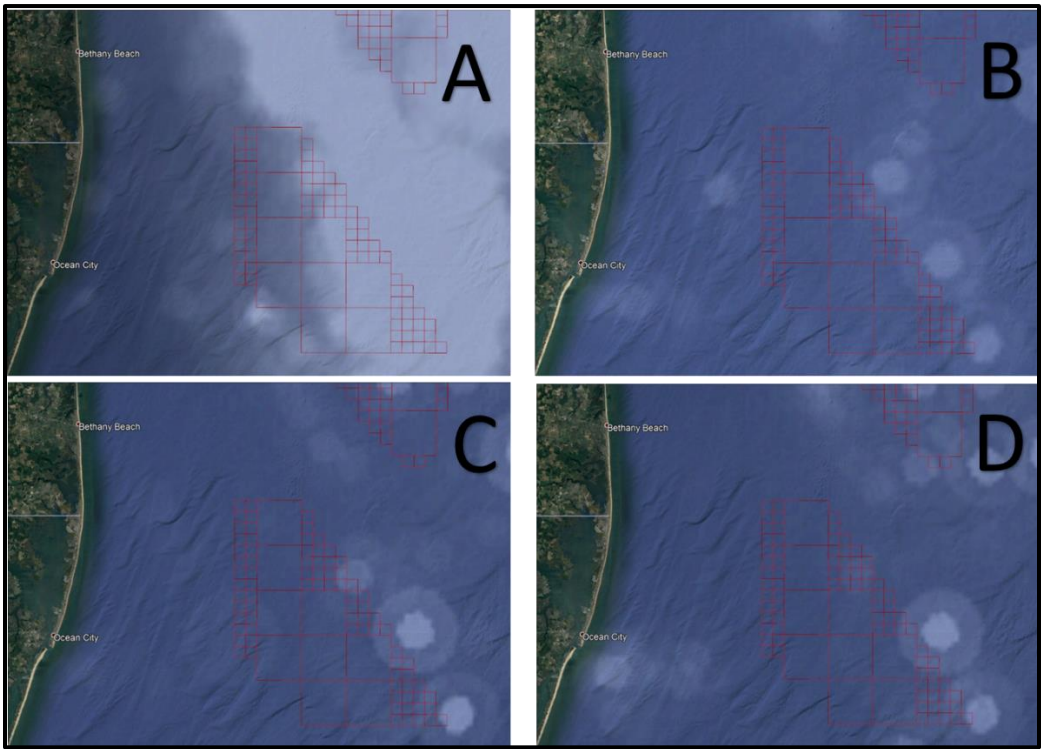

Figure 3.5: Black Sea Bass (BSB) revenue showing bulk 6-year history from 2007–2012 in panel (A) for BSB only, then recent single year revenues for the BSB, Summer Flounder, and Scup species complex from 2016 (B), 2017 (C), and 2018 (D).

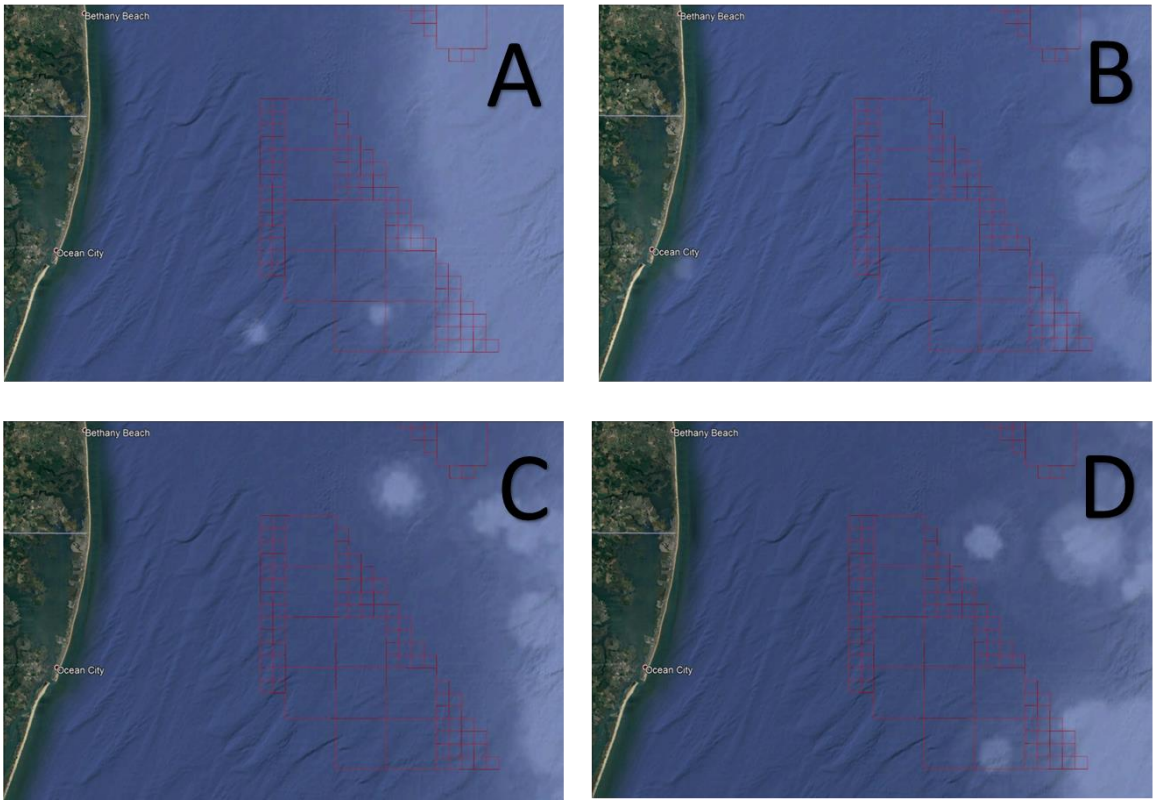

Figure 3.6: Surf Clam revenue showing bulk 6-year history from 2007 – 2012 in panel (A), then recent single year revenues from 2016 (B), 2017 (C), and 2018 (D).

3.2. Revenue by Port

The regional nature of commercial fishing results in several regional ports deriving revenue from the US Wind Lease Area. When considering the overall landings and value of landings by port, the port of Ocean City, MD has consistently ranked 20th or lower from 2017-2020 when considering the ports from MA through NC (**Table 3.3**), with an annual revenue range of $4.6 - $7.3 million over that same time period.

The ports identified in **Table 3.4** are estimated to receive the most landings from fishing done within the US Wind Lease Area; **Table 3.5** shows the revenue derived by state. As expected, Ocean City, MD, and the state of Maryland, derive the most revenue from the area. The state of New Jersey and the associated ports of Cape May, Sea Isle City, Atlantic City, and Barnegat also figure prominently in the data. The state of Virginia, and its associated ports, fall below Massachusetts when considering revenue from the area.

It is important to note that the "All Others" reference in thein **Table 3.4 and Table 3.5** include data that may not have reached the required confidentiality threshold for release. These data are likely to include revenue from the state of Delaware as well as data from the port of Reedville, VA, where the Menhaden vessels are located.

Year	Port	Pounds (Millions)	Dollars (Millions)
2020	New Bedford, MA	115.4	376.6
2020	Cape May-Wildwood, NJ	103.7	92.8
2020	Reedville, VA	301.5	63.9
2020	Gloucester, MA	48.8	50.1
2020	Hampton Roads Area, VA	13.3	49.5
2020	Point Judith, RI	42.6	46.7
2020	Point Pleasant, NJ	35.3	35.7
2020	Provincetown-Chatham, MA	21	25.1
2020	Long Beach-Barnegat, NJ	5.6	21.7
2020	Wanchese-Stumpy Point, NC	13.9	18.8
2020	Beaufort-Morehead City, NC	8	16.8
2020	Boston, MA	16.7	16.5
2020	Montauk, NY	10	14.7
2020	North Kingstown, RI	19.6	14.4
2020	Accomac, VA	6.2	13.4
2020	Atlantic City, NJ	17.5	12.4
2020	Oriental-Vandemere, NC	4.1	9
2020	Engelhard-Swanquarter, NC	5.4	8.2
2020	Newport, RI	5.2	7
2020	Ocean City, MD	2.7	5.2
2020	Fairhaven, MA	3.1	5
2020	Hampton Bay-Shinnicock, NY	3.6	4.3
2020	Columbia, NC	2.7	3.3
2020	Little Compton, RI	4.7	2.8
2020	Chincoteague, VA	2.7	2.5

Year	Port	Pounds (Millions)	Dollars (Millions)
2019	New Bedford, MA	115.8	450.8
2019	Cape May-Wildwood, NJ	94.5	90
2019	Point Judith, RI	48.1	65.9
2019	Gloucester, MA	50.2	56.6
2019	Hampton Roads Area, VA	17.4	56.1
2019	Reedville, VA	364.9	36.9
2019	Point Pleasant, NJ	37.3	35.4
2019	Provincetown-Chatham, MA	18.8	32
2019	Long Beach-Barnegat, NJ	7	24.9
2019	Beaufort-Morehead City, NC	9.9	24.7
2019	Wanchese-Stumpy Point, NC	17.5	21.8
2019	Boston, MA	18.8	19.3
2019	Montauk, NY	11.5	17.8
2019	Atlantic City, NJ	23.5	17.2
2019	North Kingstown, RI	19.2	14.1
2019	Accomac, VA	6.1	11.9
2019	Fairhaven, MA	4.9	10.9
2019	Engelhard-Swanquarter, NC	6.8	10
2019	Oriental-Vandemere, NC	4.2	9.5
2019	Newport, RI	4.9	7.8
2019	Ocean City, MD	4.7	7.3
2019	Hampton Bay-Shinnicock, NY	4	5.7
2019	Sneads Ferry-Swansboro, NC	2	5.7
2019	Stonington, CT	2.8	4.4
2019	Columbia, NC	4.8	4.1

Year	Port	Pounds (Millions)	Dollars (Millions)
2018	New Bedford, MA	113.5	431.1
2018	Cape May-Wildwood, NJ	101.2	66.3
2018	Point Judith, RI	47.5	63.7
2018	Hampton Roads Area, VA	14.7	54.7
2018	Gloucester, MA	59	53.2
2018	Reedville, VA	352.5	36.2
2018	Provincetown-Chatham, MA	22.5	34.8
2018	Point Pleasant, NJ	43.3	32.4
2018	Long Beach-Barnegat, NJ	6.3	24.3
2018	Wanchese-Stumpy Point, NC	16.4	19.5
2018	Atlantic City, NJ	24.8	18.2
2018	Montauk, NY	11.3	17.3
2018	Beaufort-Morehead City, NC	9.9	16.6
2018	Boston, MA	17	16.4
2018	North Kingstown, RI	22.8	16
2018	Accomac, VA	6.2	12.1
2018	Engelhard-Swanquarter, NC	8.4	10.8
2018	Fairhaven, MA	3.2	8.4
2018	Oriental-Vandemere, NC	3.7	8.1
2018	Newport, RI	5.5	7.9
2018	Hampton Bay-Shinnicock, NY	3.6	5.7
2018	Ocean City, MD	4.2	4.8
2018	New London, CT	7.2	4.2
2018	Little Compton, RI	3.1	2.9
2018	Belford, NJ	4.9	1.9

Year	Port	Pounds (Millions)	Dollars (Millions)
2017	New Bedford, MA	110.8	389.5
2017	Cape May-Wildwood, NJ	101.6	81
2017	Hampton Roads Area, VA	15.5	58.1
2017	Point Judith, RI	44.3	57.4
2017	Gloucester, MA	63.9	52.6
2017	Point Pleasant, NJ	37.5	35.3
2017	Provincetown-Chatham, MA	22.3	33.8
2017	Reedville, VA	319.9	32.5
2017	Long Beach-Barnegat, NJ	7.6	24.7
2017	Wanchese-Stumpy Point, NC	15.7	24
2017	Beaufort-Morehead City, NC	14.2	20.6
2017	Atlantic City, NJ	24.7	18.6
2017	North Kingstown, RI	27	17.7
2017	Boston, MA	15.8	17.3
2017	Montauk, NY	10.1	14.8
2017	Engelhard-Swanquarter, NC	8.9	12.8
2017	Accomac, VA	5.9	12.8
2017	Fairhaven, MA	3.2	10.3
2017	Oriental-Vandemere, NC	4.1	9.8
2017	Newport, RI	7.3	8.5
2017	Stonington, CT	1.8	6.2
2017	Hampton Bay-Shinnicock, NY	3.8	6.1
2017	Sneads Ferry-Swansboro, NC	2.6	5.8
2017	Ocean City, MD	4.4	4.6
2017	Chincoteague, VA	1.9	3.9

Table 3.3: Overall revenue and landings by port from 2017-2020 for ports from MA-NC. *Source: National Oceanic and Atmospheric Administration (NOAA) Greater Atlantic Regional Fisheries Office 2020*

Port	State	12-Year Revenue ($)	Annual Revenue Avg ($)
Ocean City	MD	$1,163,000	$96,917
Cape May	NJ	$434,000	$36,167
New Bedford	MA	$283,000	$23,583
All Others		$164,000	$13,667
Newport News	VA	$161,000	$13,417
Atlantic City	NJ	$135,000	$11,250
Hampton	VA	$69,000	$5,750
North Kingstown	RI	$49,000	$4,083
Chincoteague	VA	$33,000	$2,750
Barnegat	NJ	$18,000	$1,500
Sea Isle City	NJ	$11,000	$917

Table 3.4: Revenue by port from landings within US Wind 1 and US Wind 2 combined for the 12-year period from 2008-2019. *Source: National Oceanic and Atmospheric Administration (NOAA) Greater Atlantic Regional Fisheries Office 2020*

State		12-Year Revenue ($)	Annual Revenue Avg ($)
Maryland		$1,163,000	$96,917
New Jersey		$598,000	$49,833
Massachusetts		$283,000	$23,583
Virginia		$263,000	$21,917
All Others		$164,000	$13,667
Rhode Island		$49,000	$4,083

Table 3.5: Landing revenue derived by state. *Source: National Oceanic and Atmospheric Administration (NOAA) Greater Atlantic Regional Fisheries Office 2020.*

4 Recreational Fishing

4.1 Regional Overview

4.1.1 Who

Fisheries are regional in nature; in addition, Ocean City, Maryland's recreational fishermen, and vessels from neighboring states will visit the Lease Area as well, particularly from Indian River and Lewes, Delaware. Many recreational vessels return seasonally during summer months from as far away as Florida to take advantage of the sport fishing opportunities off Maryland. Among these are 'For Hire' charter vessels or party boats with a clientele of local residents as well as visitors from around the United States and the world. Prominent, world-famous fishing tournaments take place off Maryland for billfishes and tunas, and bring significant economic benefit to the region's hotels, restaurants, and retail businesses.

4.1.2 What

The primary landings and target species for the recreational fisheries are summer flounder, bluefish, black sea bass, striped bass, shark sp., tuna sp., and other pelagic species (e.g. mahi mahi and billfishes such as marlin). The primary method of sport harvest is hook/line but there

is also a small recreational pot/trap fishery for crab and lobster which should be noted for the purposes of this assessment.

4.1.3 Where

The waters off Maryland and Delaware are part of what is commonly referred to as the Mid-Atlantic Bight, which stretches from New York to Virginia. The area being discussed is limited to the Lease Area and adjacent waters on the continental shelf area off Maryland and southern Delaware. Although many of the fisheries discussed will take place throughout the region, this assessment focuses on those within and in proximity to this limited area. Three popular ship wreck sites are targeted by recreational vessels in the northern half of the Lease Area: The Washingtonian, the Elizabeth Palmer, and Twin Wrecks North (Figure 4.1 below).

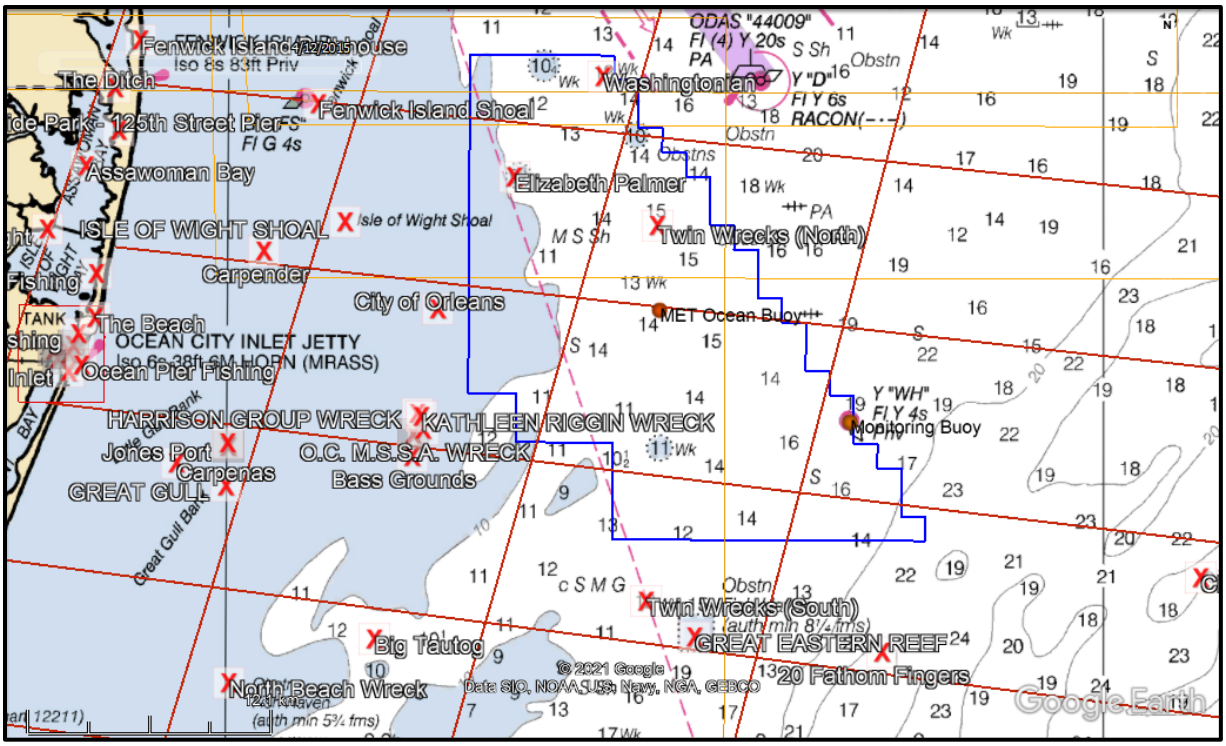

Figure 4.1: Red "x" marks popular wreck fishing sites off Maryland, including three inside the Lease Area.

4.2 For Hire Vessels

The majority of the regional recreational fleet is made up private vessels, although there is a substantial 'for hire' fleet that mainly operates during summer and fall months. The 'For Hire' fleet consists of Party/Head Boats and Charter Boats. The party/head boats are typically 60 to about 100 feet in length and carry about 20 to 80 passengers. Charter boats are about 35 to 60 feet in length and typically carry up to 6 anglers (e.g., six-pack vessels) depending on vessel size.

Figure 4.2: Recreational fishing data is generalized but demonstrates activity in the Lease Area (Source: MARCO Data Portal).

Figure 4.3: Examples of Party/Head boats. These vessels are based in Indian River, DE (Photo: Wolfgang Rain/Sea Risk Solutions)

Figure 4.4: Examples of typical charter boats

4.3 Private Vessels

Privately owned vessels make up a significant portion of the overall recreational fishing effort, with much effort concentrated in the bays and inshore areas less than 3 miles from shore. Organized saltwater fishing tournaments are popular public events that take place in the vicinity of the Lease Area and around wreck sites and artificial reefs. Fishing tournaments are economically important to local cities and towns.

Although it is unlikely that recreational anglers will have any physical impact on an operational wind farm, their presence on the water during marine survey and construction activities could impact operations. Recreational fishing clubs and angler associations have significant memberships in Maryland, Delaware, Virginia, New Jersey, and throughout the country; it is important to identify and engage them throughout the planning process.

4.4 Gear Description

Rod and reel (pole and line) is the gear used regardless of vessel type. The common fishing techniques are chumming, wreck/bottom fishing, drifting, and jigging. Trolling is generally restricted to charter vessels with fewer people (i.e., lines in the water) than larger party boats.

In addition to the traditional recreational fishing methods, there will also be some minor amount of recreational pot/trap fishermen. Their effort will be very difficult to identify/quantify. It is conducted using single pots/traps rather than a string of gear, and the majority of effort takes place within three miles of shore or in the bays.

4.5 Activity within Lease Area

Charter and party boats generally fish further offshore than many privately owned vessels, due to the need for a larger vessel, the associated costs, and necessary seamanship skills.

As has been the case with the Block Island Wind Farm and the Coastal Virginia Offshore Wind Pilot Project, it is likely that the presence of turbines will attract additional recreational activity. It should be expected that recreational fishing activity, and sightseeing, will increase in the offshore area once the wind farm is in operation.

The Maryland Artificial Reef Initiative operates in partnership with the Maryland Department of Natural Resources, with around a dozen artificial reef sites primarily inshore of the Lease Area and some to the south. These artificial reef areas, as well as other natural and man-made seabed features, are recreational fisheries hotspots (Figure 4.5 below).

Export cable routes must also consider existing recreational fishing hotspots by routing around identified, existing obstructions. Additionally, when planning survey and construction operations at the export cable landing site(s), commercial and recreational fishermen should be considered.

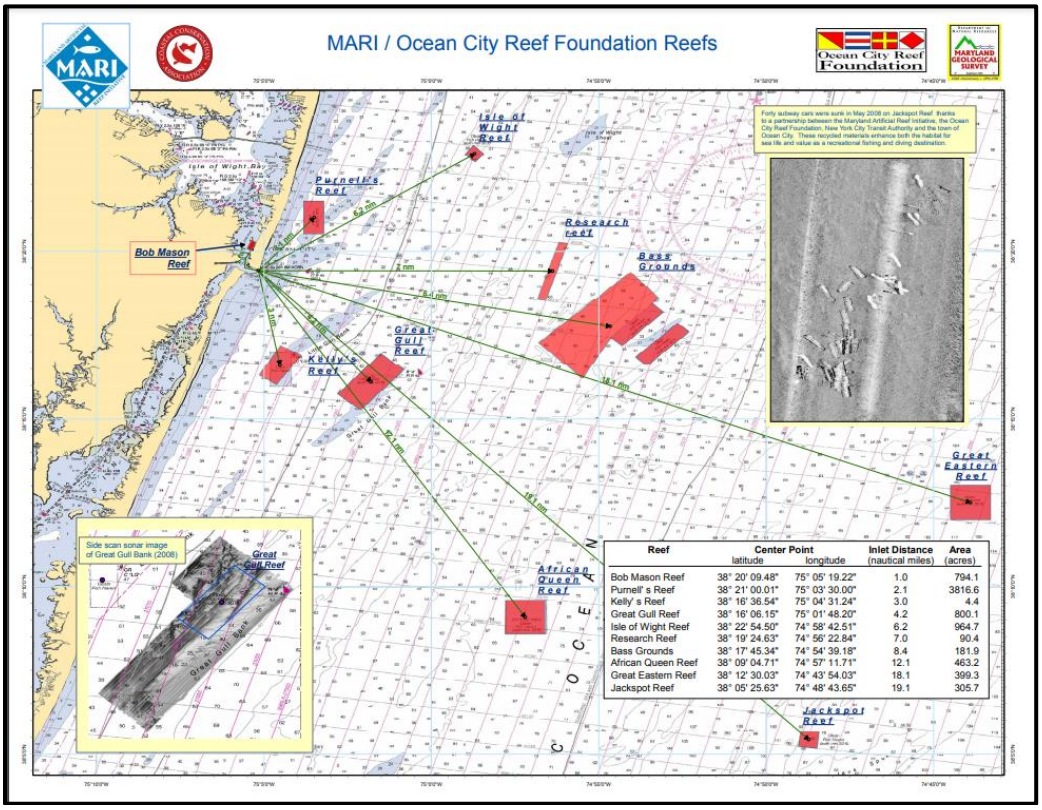

Figure 4.5: Chart of reef areas off Maryland (Source, Maryland DNR).

Figure 4.6: Example of Party/Head boat fishing among existing wind turbines off Block Island, RI

5 Fishing Vessel Transits

5.1 Traditional Transit Lanes

Disruption of traditional fishing vessel transit lanes between different ports and from ports to fishing grounds is a concern for commercial and recreational fishermen. Typically, vessels undertake a straight line transit from existing position to destination without obstructions and/or waypoints. Installation of turbine arrays will require changes to transit routes and may increase fuel costs to fishers transiting through or around the Lease Area; existing transit routes should be considered when planning arrays.

5.1.1 Commercial

Traditional transit patterns for vessels out of Ocean City, MD, will likely experience the most impact of any fishery. AIS data reveals that vessels will head to selected fishing grounds after departing the inlet; this is primarily a roughly west/east transit route to fishing grounds. Vessels transiting from points north and south, bypassing Ocean City, MD, to access regional fishing grounds offshore of the Lease Area will transit in a direction that is generally North/South and may choose to avoid the Lease Area once it is built out.

Concerns have been expressed by local fishermen to establish west/east trending transit corridor(s) from Ocean City, or otherwise ensure navigational safety measures, for access to the offshore sea bass pot fishery that is most dense just outside and along the eastern boundary of the Lease Area.

Additionally, a review of AIS data indicates that commercial cargo vessels approaching or exiting the Delaware Bay shipping lanes routinely transit the eastern portion of the Lease Area. After development of the Lease Area, this traffic will be forced eastward, outside and along the Lease Area boundary, which may increase the navigational safety risks for vessels exiting the wind farm and possibly lead to greater loss of fishing gear in areas where pot fisheries for black sea bass and lobster typically occur.

Fishing vessels that do not carry AIS transponders or routinely have them turned on while fishing or in transit outside the Territorial Sea limit (12 nm), may experience increased risk from the shift of shipping traffic into the fishing areas outside the east and southeast boundary of the Lease Area, particularly during periods of combined fog and rough weather when small vessels may not be as discernable on radar.

5.1.2 Recreational

Traffic patterns of recreational fishing vessels are less well understood overall, as most of these do not transmit AIS. However, AIS data from the few recreational vessels that have transponders on board, indicate that transit patterns may be more diverse and meandering than those of commercial fishing boats. Nevertheless, recreational vessels targeting highly migratory species offshore, appear to use similar east/west transit courses as commercial vessels. It should be noted that recreational activity within the Lease Area is expected to increase once the turbines are built out and transit patterns through and within the Lease Area will change as a result.

These navigational concerns associated with the funneling of merchant traffic entering and exiting the Delaware Bay TSS are also valid for the many offshore recreational fishing vessels that transit from Ocean City MD, Indian River, and Lewes, DE to the offshore fishing grounds.

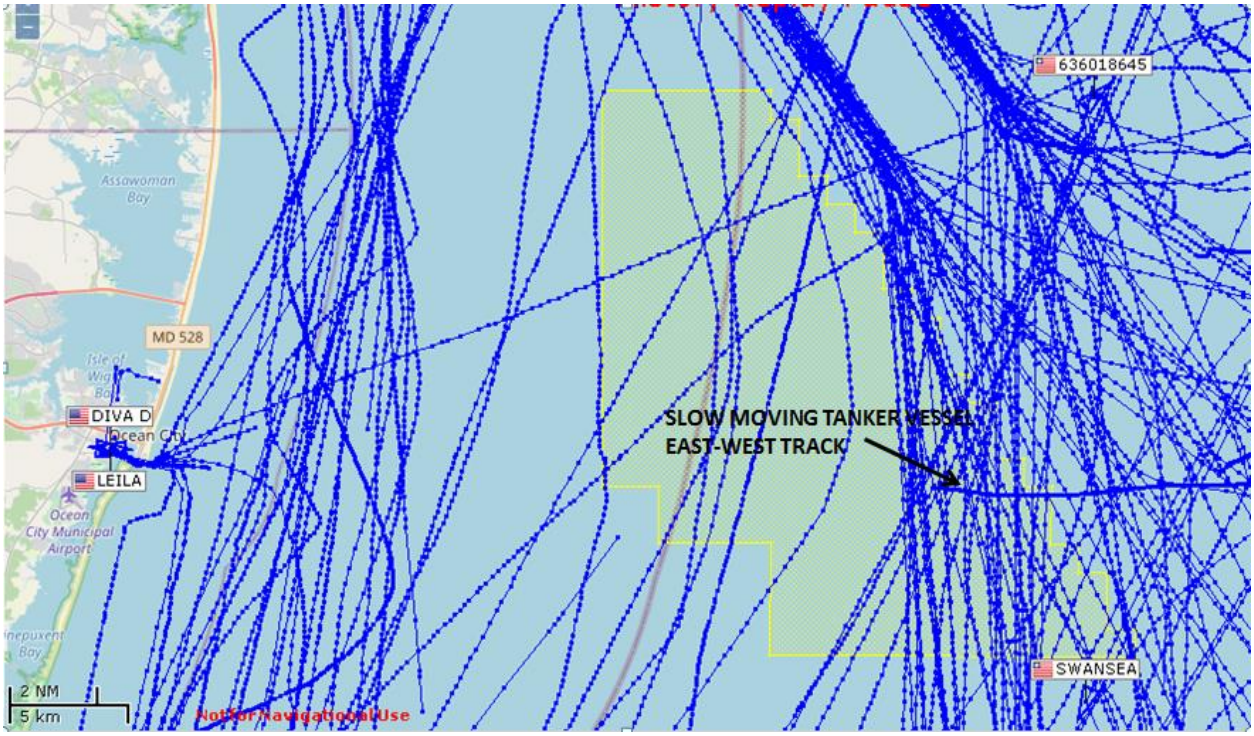

Figure 5.1: AIS traffic during a period of low fishing, 24-31 March 2021. Coastal transport routes are evident midway between shore and the western boundary of the Lease Area. Cargo vessel traffic is dominant in the eastern part of the Lease Area. The dense track from east to west in the SE part of the Area is a slow-drifting Greek tanker (Source: Sea Risk Solutions/Siitech WebVTS)

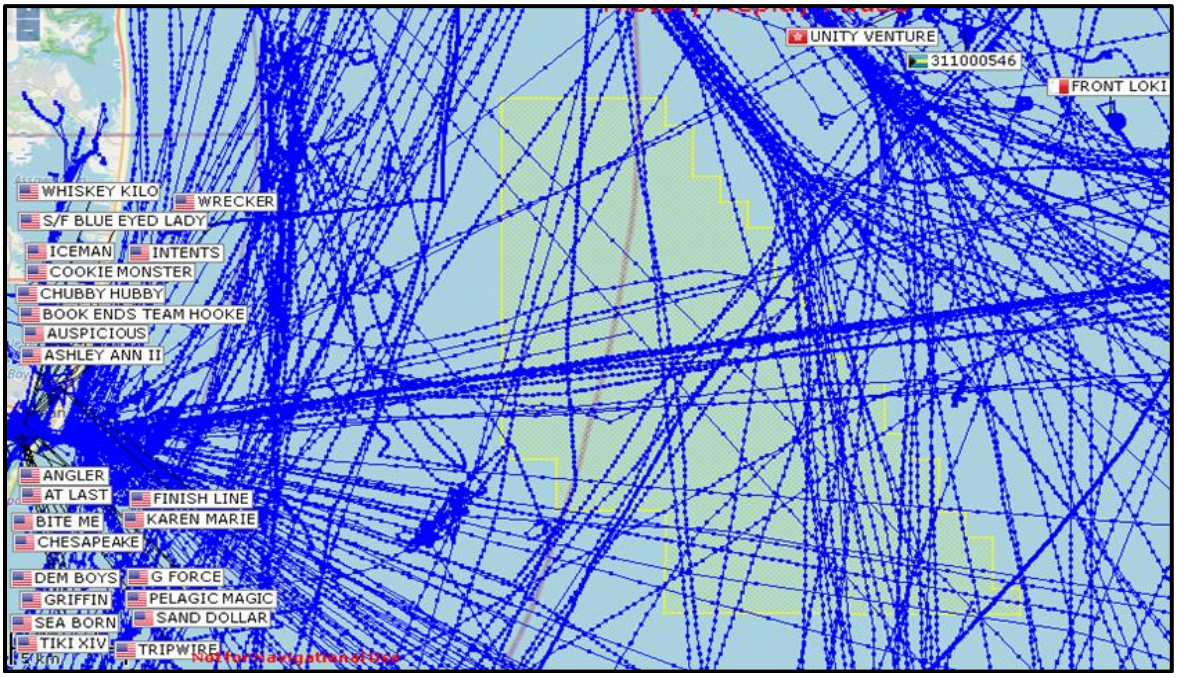

Figure 5.2: AIS tracks 24-31 July, 2020. Summer fishing season shows more east-west transits out of Ocean City through the Lease Area.

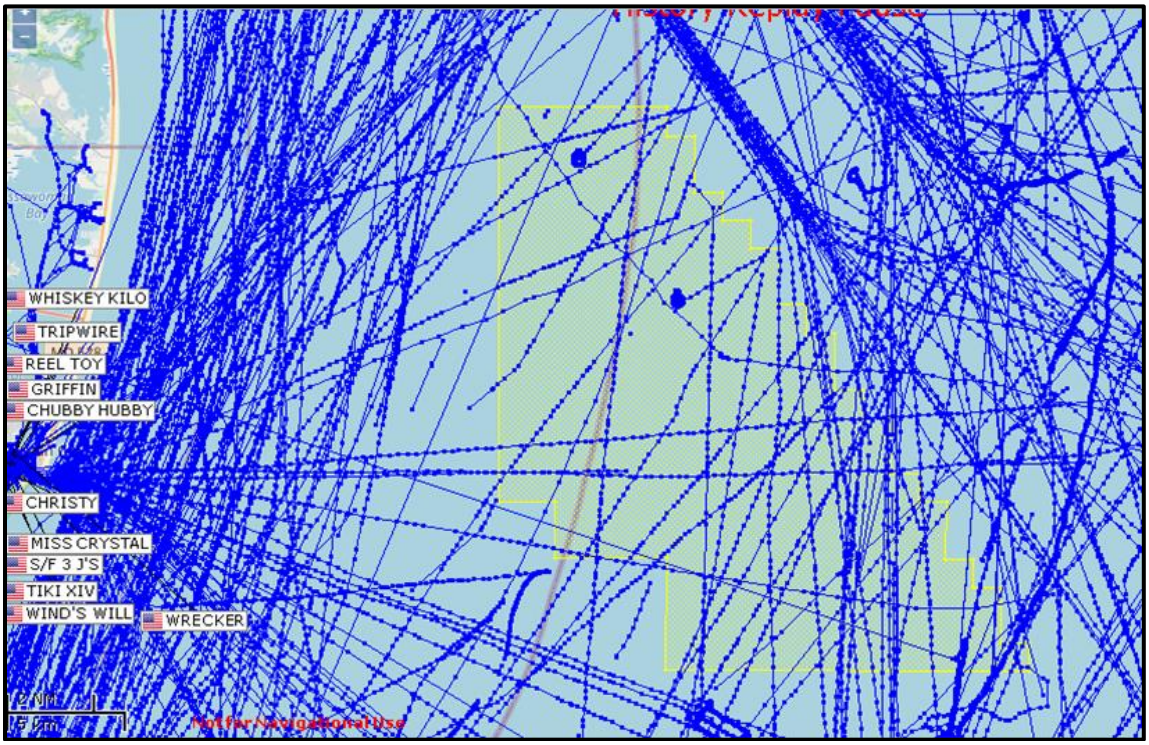

Figure 5.3: AIS tracks 24-31 October, 2020. Two cargo vessels leaving the Delaware Bay TSS anchored for several days inside the northern part of the Lease Area, seen as dense spots. The two east-west lines across the middle of the Area are the track of the Ocean City-based clam dredger, Betty C to and from clam beds to the east.

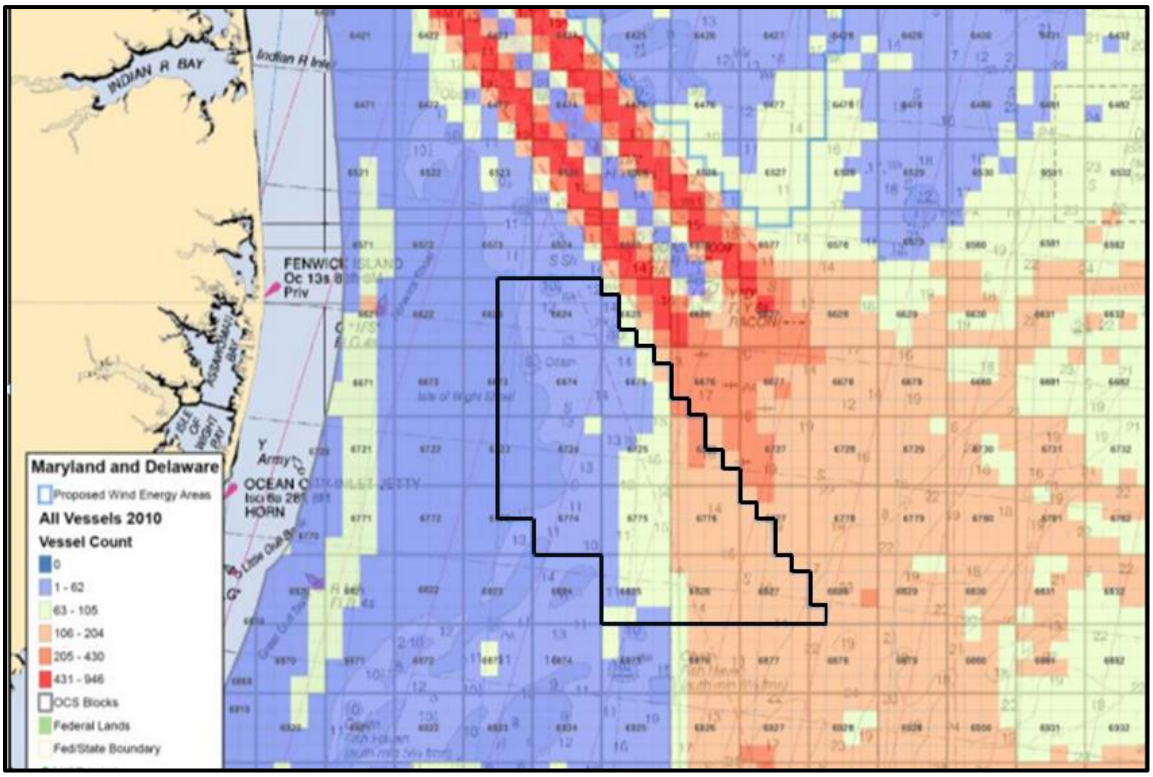

Figure 5.4: Density plot of commercial shipping traffic 2010 (Source: United States Coast Guard ACPARS Final Report 7-8-2015)

Appendix A – NASCA Cable Burial Experience

North American Submarine Cable Association (NASCA)

Cable Burial Experience on the Northeast Coast of the United States

Date: August 15, 2019

The purpose of this NASCA cable burial experience statement is to share the cable burial experiences of the submarine telecom cable industry with other offshore stakeholders who may find it necessary to protect their subsea assets from fishing and marine resource harvesting operations.

Submarine telecommunications cables have landed at sites along the Northeast Coast of the United States for decades. During the 1980's and 1990's, submarine telecom cables located in the Northeast United States seaboard suffered several cases of damage from hydraulic clam dredges. During that period the typical target burial depth for telecom cables in this region was two to three feet (0.6 to 0.9 meters)

Hydraulic clam/quahog dredges penetrate the seabed more than other mobile fishing and harvesting gear such as scallop dredges and otter trawls. Numerous studies have examined seabed penetration of these gear types (Stevenson et al[1]).

[1] Stevenson D, Chiarella L, Stephan D, Reid R, Wilhelm K, McCarthy J, Pentony M. **Characterization of the fishing practices and marine benthic ecosystems of the northeast US shelf, and an evaluation of the potential effects of fishing on essential habitat.** NOAA Tech Memo NMFS NE 181; 179 p.

In response to this external threat, since the year 2000, submarine cable systems have been buried to a typical target depth of 5 to 6 feet (1.5 to 2 meters) where seabed conditions permit. Shallower burial in hard, dense sea beds has been sufficient to protect the cable. Since this change, the subsea telecom cable regional damage rates resulting from fishing and hydraulic clam dredging operations have been reduced to near zero.

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Mid-Atlantic Regional Council on the Ocean (MARCO), http://portal.midatlanticocean.org/

Maryland Mapping & GIS Data Portal https://imap.maryland.gov/pages/default.aspx