Appendix A. Data and Methodology for Developing Revenue Exposure Estimates in the Northeast Atlantic

This appendix has been developed to specifically aid lessees with offshore wind energy leases in the Northeast Atlantic, from Cape Hatteras to the Gulf of Maine, to develop revenue exposure estimates for compensatory mitigation of lost income to fisheries as a result of offshore wind energy development. The datasets discussed are exclusive to Northeast states and the National Marine Fisheries Service (NMFS) Greater Atlantic Regional Fisheries Office (GARFO). Guidance for revenue exposure data and methodologies for other regions may be developed at a later time.

BOEM has developed this guidance in consultation with state and Federal partners, including the National Marine Fisheries Service. However, this guidance is wholly the product of BOEM. Fisheries science and identification of past, current, and future fishing activity in the northeast, is highly dynamic and influenced by several factors, including but not limited to fisheries management, market conditions, potential biological impacts from offshore wind development, and changing conditions brought about by climate change. Thus, data representing fishing operations are inherently variable and complex, increasing the uncertainty when evaluating economic exposure and potential compensation estimates for individual wind energy projects.

Commercial Fisheries

As discussed in the National guidance, BOEM recommends that analyses of fisheries compensation plans begin with assessing the revenue exposure of actions proposed in the COP that may disrupt or displace fishing activity. Revenue exposure is the total amount of fishery revenue generated within a defined area (e.g., an offshore wind energy project area) and based on historical data that could be foregone if vessel operators no longer fish within that area due to offshore wind energy construction and operation activity. In the northeast U.S., the primary means of determining revenue exposure is from the NMFS/GARFO fishery footprint and related socioeconomic impacts of Atlantic offshore wind development (see link in Table 1 below). BOEM believes there is a high degree of confidence in revenue exposure for those derived data products for the following fisheries[1]:

- Atlantic Herring
- Bluefish
- Golden Tilefish
- Mackerel/Squid/Butterfish
- Monkfish

[1] A full glossary of fisheries terms used in this appendix is found here: https://repository.library.noaa.gov/view/noaa/12856

- Multispecies Large Mesh (American plaice, Atlantic cod, Atlantic halibut, Atlantic wolffish, Haddock, Ocean pout, Offshore hake, Pollock, Redfish, Red hake, Silver hake (whiting), White hake, Windowpane flounder, Winter flounder, Witch flounder, Yellowtail flounder)
- Multispecies Small Mesh (silver hake, offshore hake, and red hake)
- Red Crab
- Sea Scallop
- Skate
- Spiny Dogfish
- Summer Flounder/Scup/Black Sea Bass
- Surfclam/Ocean Quahog

While NMFS reports other species in its fishery revenue exposure data product, the ones listed above are the most complete and accurate. It is the responsibility of the lessee to ensure that the spatial footprint available on the NMFS webpage accurately reflects the proposed action in the lessees' COP. If the information is not correct the lessee should work with BOEM and NMFS to request an analysis based on the proposed action. Data requests should include all years of data from 2008 up to the current available year be used to calculate the annualized revenue exposure. This request should occur prior to the COP being submitted to BOEM. Considerations for "data-limited" species and recreational fishing are described separately below.

While the revenue exposure calculations are a great resource, BOEM recommends that lessees also evaluate data derived from vessel monitoring systems to better understand finer scale vessel activity, annual variation in fishing activity, and transit routes to fishing locations.

Within the NMFS/GARFO region, individual federal Fishery Management Plans (FMP) required federal permit holders to use VMS over time. The following list includes the year in which each FMP required federally permitted vessels to begin using VMS. There are publicly available VMS data products listed in Table 1 below.

- Monkfish: optional and elective on a yearly basis
- Atlantic Herring: 2005
- Northeast Multispecies (groundfish): 2006
- Atlantic Scallops: 2006
- Surfclam/Ocean quahogs: 2008
- Atlantic Mackerel: 2014
- Longfin Squid/Butterfish: 2016
- Illex Squid: 2017

It should be noted that there are some limitations to VMS. Not all federal FMPs require VMS and some fisheries are not covered by VMS at all (note what is covered above). If a vessel is

issued a permit in another federal FMP that requires VMS, trips taken in non-VMS fisheries are mostly represented by a "DOF-COM" VMS trip declaration (e.g., a commercial fishing trip that is declared out of an FMP managed by days-at-sea effort controls). This activity cannot be assigned to a specific FMP or target species (e.g., summer flounder) unless each trip is corroborated with a VTR or other reported information. Additionally, a vessel can "target" one species and catch another—even in greater amounts—on any trip, limiting the utility of VMS trip declarations of vessel intent. Data from VMS can be difficult to link to dealer reports. Other limitations to VMS are related to assumptions used when analyzing the data. Fishing time/location can be misestimated by operational assumptions (speed and direction) that are affected by externalities (weather, sea state, mechanical issues) and fishing practices (e.g., drifting to repair gear, sort/shuck catch, and store product). Further, differentiating harvesting activity from vessel transit must be inferred using vessel speed and course adjustment, while vessel speed and different position ping rates (30-60 minutes) can limit the area. Vessel course changes can be influenced by several factors. Harvesting speeds vary by fishery, and transiting speed depends on the vessel, weather, sea state, and other factors.

Table 1. Derived Fishery Revenue Exposure Products	
Derived Fishery Revenue Exposure Products	
SOURCE	**TITLE**
NOAA NMFS	Fishing Footprints for the New England/Mid-Atlantic Region, https://apps-nefsc.fisheries.noaa.gov/read/socialsci/fishing-footprints.php
NOAA NMFS	Socioeconomic Impacts of Atlantic Offshore Wind Development, https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development?utm_medium=email&utm_source=govdelivery
BOEM	*Socio-Economic Impact of Outer Continental Shelf Wind Energy Development on Fisheries in the U.S. Atlantic*: OCS Study BOEM 2017-012, Kirkpatrick, et.al. [2], https://espis.boem.gov/final%20reports/5580.pdf
RIDEM (2017)	Spatiotemporal and economic analysis of vessel monitoring system data within wind energy areas in the greater North Atlantic, http://www.crmc.ri.gov/windenergy/vineyardwind/VW_EconExposureCommFisheries.pdf
RIDEM (2018)	Addendum: Spatiotemporal and economic analysis of vessel monitoring system data within wind energy areas in the greater North Atlantic, http://www.crmc.ri.gov/windenergy/vineyardwind/RIDEM_VWFishValue_20190114.pdf
Original Fishery Data Sources	
NOAA/NMFS	Vessel Monitoring System data (aggregated data available on NROC and MARCO data portals, trip level data not publicly available)
NOAA/NMFS	Federal fishing vessel trip reports and dealer reports
ASMFC	Atlantic Coastal Cooperative Statistics Program (public data warehouse accessible via sign up)

[2] Please note that this study is similar to the NMFS Fishing Footprints product, but its methodology is different and would require significant additional work for what NMFS is able to do currently in its Footprints product.

Data-Limited Commercial Fisheries

There are several species where there are substantial limitations to existing data sets for calculating revenue exposure. These data-limited species include, but are not limited to, American lobster, Jonah crab, whelk, Atlantic menhaden, Atlantic croaker, and highly migratory species (HMS). These species may be captured in the NMFS/GARFO fishery footprint data sets, however, they may not fully represent the actual revenue exposure for that fishery. For example, species like whelk/conch, horseshoe crab, and tautog are likely to have less than 50% of their landings captured in the NMFS/GARFO fishery footprint dataset. Species like Jonah crab and lobster may have good representation in the NMFS/GARFO data in Southern New England but less so for inshore areas in the Gulf of Maine. The lessee is advised to evaluate data sources including fisheries stock assessments, Atlantic Coastal Cooperative Statistics Program (ACCSP), federal and state fishery independent and dependent surveys, industry owned data and knowledge (that ensures proper use of proprietary information e.g., Fisheries Knowledge Trust), and/or high-resolution bathymetry/habitat mapping. From this information, it is possible to apply a multiplier based on what is in the NMFS/GARFO data and what is captured in other data sources. This concept is visualized in Figure A2 of Attachment 1, which provides an estimate of representativeness of NMFS/GARFO VTR landings data when compared to total landings. Attachment 1 to this Appendix describes the limits of some of these species. Ultimately, BOEM recommends working collaboratively with state and Federal fisheries management agencies regarding all revenue exposure data, but this is especially important for data-limited species.

Recreational Fisheries

Recreational fishing sectors in the northeast U.S. include NMFS/GARFO permitted charter and party vessels, highly migratory species (HMS) charter vessels, and private recreational angling. Of these three categories of recreational fishing, only the NMFS/GARFO permitted charter and party vessels are included in the socio-economic assessments developed by NMFS for each project area (See Table 1). Since there is no dealer sale for recreational fisheries, NMFS uses the results from industry surveys to assign a for-hire passenger fee per reported trip (https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development) to determine the revenue exposure for this sector. NMFS does not use the fishery footprint method for party/charter vessels. Party/charter data reflects only the point locations identified by the vessel operator and there is no independent data source to verify and model fishing location as available for commercial trips (i.e., there are no observers on party/charter trips).

For recreational fishing sectors other than NMFS/GARFO charter and party vessels, BOEM recommends conducting similar exposure estimates to Kirkpatrick et al.[3]) with the most recently available data and using at least 5 years of data. The exposure is calculated by using the average

[3] https://espis.boem.gov/final%20reports/5580.pdf

annual percent of those trips from each state that occurred in federal waters. It should be noted that this method may also not be inclusive of all vessels as some (e.g., HMS) may be traveling further to fishing grounds than the suggested 30 miles used in Kirkpatrick et al. The recreational fishing industry should be consulted on these methods.

Shoreside Seafood Businesses

As described in the National guidance, there may be impacts not only to harvesters, but also indirect costs to shoreside businesses. Shoreside businesses can generally be categorized as upstream (e.g., bait suppliers, ice suppliers, and other provisioning for harvest trips) and downstream (e.g., seafood dealers and processors). BOEM recommends using the Seafood Industry Impacts tool[4] (using state-specific economic impact tables based on the Fishery Economics of the United States report (2018)) and IMPLAN software model (2004). However, there are other sources and methods, including fishery-specific methods, that may be applicable and should be considered.[5] Each method has constraints and possible methodological biases. For instance, IMPLAN[6] / input-output type models may overestimate downstream revenue impacts given they do not allow input substitution (e.g., a processing company may substitute imports in instances of reduced landings, which would reduce the magnitude of downstream losses/revenue impacts). Previously approved COPs have used these tools to identify a multiplier (approximately 1-2%) to be used against the revenue exposure calculation for determining sufficient funds for claims of income loss. Lessees should discuss methods to calculate indirect revenue exposure with state and NMFS/GARFO staff.

Standards for Reporting and Forecasting Revenue Exposure

When developing statistics on past fishery revenue exposure to forecast future revenue exposure and potential impacts from the proposed project, the lessee should consider information such as stock assessments, fisheries management actions, market conditions, and other factors that may influence revenue and landings over the period of the data analysis. For example, are fishery landings on an increasing or declining trend? What conditions are driving the trend? Are there old or new management measures that may result in a changed distribution of fishing effort? It is important to understand the data to accurately assess future revenue exposure and impacts.

[4] https://www.st.nmfs.noaa.gov/data-and-tools/FEUS/explore-the-data

[5] King, et.al., Economic Exposure of Rhode Island Commercial Fisheries to the Vineyard Wind Project, 2019; Rhode Island Department of Environmental Management, Rhode Island Fishing Value in the Vineyard Wind Construction and Operations Plan Area, 2019; Sproul letter, 31 May 2019 and King response, 14 November 2019, in Vineyard Wind's Construction and Operations Plan, volume 3, appendix 3. https://www.boem.gov/sites/default/files/documents/renewable-energy/Vineyard-Wind-COP-Volume-III-Appendix-III-P_0.pdf

[6] https://www.st.nmfs.noaa.gov/documents/Commercial%20Fishing%20IO%20Model.pdf

Revenue exposure analyses included in plans should use the GDP Implicit Price Deflator for standardizing dollar amounts across years. The GDP Implicit Price Deflator is also the standard used by NMFS in fisheries management analyses.

Attachment 1: Data-Limited Species Snapshots[7]

Whelk

Commercial Fishery: The whelk commercial fishery exists along the US Atlantic Coast and is mainly targeted by pots. Knobbed and channeled whelk are the primary species landed for most states, with lightning whelk also occurring in lesser amounts from Virginia to Georgia.

Where: US Atlantic Coast from Massachusetts to Georgia, with most of the commercial fishing occurring in the mid-Atlantic and New England regions.

Management: Whelk, sometimes called conch, is managed state by state, with minimum legal sizes (MLS) and reporting requirements varying by state. There is no FMP or federal permit required.

Harvest and Data Reporting: Harvest occurs in both state and federal waters, but no federal reporting requirements exist. VTRs are submitted only by vessels that carry federal permits for other species. Whelk is included in federal VTRs as bycatch when targeting other species, and federal VTR, dealer data, or fishing footprints should not be considered definitive sources of whelk catch and effort information.

All states have mandatory landings reports for whelk harvested in state waters. However, not all whelk landings are reported by species, dealer reporting is not mandatory among all states, gear type is not always reported, and not every state conducts biological sampling. The minimum landing size is not consistent among states, with some states lacking any kind of size regulation, which biases landings towards states with preferable regulations. Landings data are inconsistent among states (varies with type of gear used, average landings by pound, and recent landings trends).

Value of Commercial Fishery: Unspecified

Data Snapshot: Years of available data are unknown. A multi-state working group was established in 2021 to collect current information on the status of whelk along the coast, with the goal of producing a summary white paper in 2022.

Summary: Whelk data primarily reside within state-specific data programs and is unlikely to contain consistent location information. When the white paper is available in 2022, data summary should be reassessed.

[7] This list is not comprehensive of all data-limited species with the potential for OSW interaction such as shrimp, smooth dogfish, spot, and others.

Jonah Crab (*Cancer borealis)*

Commercial Fishery: Jonah crab were initially taken as bycatch in the lobster fishery along the Atlantic coast. Over the last two decades, landings have increased to a directed fishery in Southern New England, primarily using trap gear. In some areas, such as Maine, reports for Jonah crab may also include rock crab. The Jonah crab harvest in Maine is still a bycatch fishery. Note: The magnitude of the Jonah crab recreational fishery is unknown at this time but is believed to be quite small compared to the commercial fishery.

Where: Atlantic coast, with MA and RI the largest reported landings.

Management: Cooperatively managed by states and NOAA through the ASMFC. An FMP exists for Jonah crab, however, there are no stock assessments or established biological reference points for this stock. A stock assessment is planned for 2022.

Harvest and Data Reporting: At the federal level, Jonah crab landings are reported on VTRs only if a vessel has a federal permit for another species. There are no federal report requirements specific to Jonah crab. Based on a preliminary evaluation, Federal VTRs capture most of the total annual Jonah crab harvest from 2014-2019. Federal VTR coverage is higher offshore, and lower closer to shore, and most landings are from offshore areas.

States have a variety of reporting requirements. Most harvesters targeting Jonah crab that are not required to fill out federal VTRs, are required to file state harvester reports which include inshore State Statistical Reporting Area, or NMFS sub areas, NMFS Statistical Areas in federal waters, and/or LCMA. Like lobster (see Lobster section, below), this changed in 2021 to report by ten-minute squares. The state harvester reports from Maine have the same subsampled limitations as lobster.

Value of Commercial Fishery: In the early 2000's landings began to increase. In 2019, landings totaled approximately 16 million pounds of Jonah crab, representing $13.1 million in ex-vessel value (https://media.fisheries.noaa.gov/2021-05/FUS2019-FINAL-webready-2.3.pdf?null=). Note that this is likely an underestimate of Jonah crab landings because of the species identification issues in Maine, but also that most landings are happening in southern New England. This could be underestimated as much as 1-2 million pounds in recent years, and as such would not be reflected by VTR's.

Data Snapshot: Data is available for ≥ 10 years, although data prior to 2008 may not be useful for assessing the current status. Federal VTRs likely capture most of the total Jonah crab harvest in recent years. NMFS statistical area data is consistently available across all states and federal reports, with some latitude/longitude information available through VTRs.

Summary: Federal VTR coverage is reasonably good for harvest information. State data can supplement if needed in areas of lower VTR coverage.

Atlantic Menhaden (*Brevoortia tyranus)*

Commercial Fishery: Atlantic menhaden is the largest east coast fishery by volume and is executed primarily in both federal and state waters using purse seines. The fishery includes commercial bait and reduction harvest and operates from Maine through North Carolina, with state regulations varying down the coast. Note: Menhaden are also important bait in many recreational fisheries and are captured by cast nets or hook-and-line for recreational use.

Where: Commercial harvest occurs from Maine through North Carolina, with the highest commercial bait landings in NJ, ME, and MA. Reduction landings only occur in VA.

Management: ASMFC regulated the fishery and leads the stock assessments, but reduction harvest information is submitted to the NMFS Southeast Fishery Science Center (SFSC).

Harvest and Data Reporting: At the federal level, bait landings are reported on VTRs, and dealer reports only if a vessel has a federal permit for another species. There are currently no federal permits for the menhaden fishing. Atlantic menhaden catch is included in federal VTRs as bycatch when targeting other species and federal VTRs and dealer reports should not be considered the primary source of Atlantic menhaden catch and effort data.

States have a variety of reporting requirements. Approximately 50% of landings from 2018-2020 are captured on state-level VTRs, which include latitude/longitude fishing location information. The remaining bait harvest reported at the state level does not include fishing location information. Reduction landings, which only occur in VA, are reported through Captain's Daily Fishing Reports (CDFRs) that include detailed location and harvest information for each purse seine net set. CDFRs are submitted to the SFSC, but access to detailed information is limited due to data confidentiality. Most commercial menhaden landings in the Atlantic occur within 3 miles of shore (154,362 mt to 42,192 mt respectively).[8]

Value of Commercial Fishery: From 2011-2020, the total commercial landings average approximately 192,000 mt annually, of which about 142,300 mt are reduction and 49,600 mt are bait harvest. Monetary value of this fishery is unspecified. Note: Estimated recreational harvest in 2020 is approximately 1,157 mt, and monetary value is unspecified.

Data Snapshot: Data is available for ≥10 years. Federal VTRs capture about 7.5% of the total harvest. From 2018-2020, approximately 50% of bait landings are captured in state VTRs. The remaining bait landings are reported at the state level and are unlikely to include location information

Summary: State-specific harvest reports may be the best source for locationally linked data

[8] https://media.fisheries.noaa.gov/2021-05/FUS2019-FINAL-webready-2.3.pdf?null= page 16

(depending on the state), but federal VTRs should also be integrated because they have location data for every trip. Some sort of correction or extrapolation may be needed to fill gaps.

Atlantic Croaker *(Micropogonias undulatus)*

Commercial and Recreational Fisheries: Atlantic croaker can be found from the Gulf of Maine to Argentina, but along the US Atlantic coast, they are most abundant from the Chesapeake Bay to northern Florida. Croaker is targeted by commercial and recreational fishers. The primary commercial gear in North Carolina and Virginia is gillnets, although trawls have been historically used. Atlantic coast commercial landings of Atlantic croaker exhibit a cyclical pattern, with low harvests in the 1960s/1970s and the 1980s/1990s, and high harvests in the mid-to-late 1970s, mid-1990s to early 2000s. Recreational fishing landings have also been variable over the last four decades.

Where: Atlantic coast, although Virginia harvests the majority of recreational croaker while North Carolina lands the majority of commercial croaker, followed closely by Virginia.

Management: Managed by ASMFC using a traffic light approach.

Harvest and Data Reporting: Spatial data is not consistently available through VTR reports as croaker is not a federally managed species. Federal VTR coverage is higher offshore, and lower closer to shore. North Carolina harvest is tracked through the state's trip ticket system which has spatial data categorized as either ocean waters 0-3 miles or greater than 3 miles and north or south of Cape Hatteras. Virginia Ocean spatial data can only be categorized between state waters and federal waters. Nearly all recreational harvest occurs within 3 miles of shore. Commercial harvest has more landings greater than 3 miles from shore than less than 3 miles from shore (https://media.fisheries.noaa.gov/2021-05/FUS2019-FINAL-webready-2.3.pdf?null=)

Value of Commercial and Recreational Fisheries: An estimated 5 million pounds of croaker were landed in 2020, with approximately 16% landed by the commercial sector and 84% harvested by recreational anglers. The monetary value of these fisheries is unspecified.

Data Snapshot: Data is available for ≥10 years. States have different levels of spatial categorization.

Summary: State harvest data may be the best source but is unlikely to contain latitude/longitude data.

Highly Migratory Species (HMS)- commercial and recreational fisheries

Fishery: Highly migratory species, such as tunas, sharks, swordfish, and billfish, travel long distances and cross domestic and international boundaries. They are targeted commercially and recreationally, using a variety of gears (longlines, seines, gillnets, and hand gear). HMS commercial fisheries are mostly offshore, while recreational fisheries may tend to overlap potential wind energy call areas. Tournaments and for-hire fisheries occur for HMS in the Atlantic

Where: US Atlantic Coast and Gulf of Mexico

Management: Atlantic HMS are managed by NOAA and require different permits for different activities.

Harvest and Data Reporting: Commercial VTR data is limited for HMS in the northeast. Commercial reports for HMS are in logbooks, including location and landings, with fishing efforts generally offshore of wind call areas. Dealer reports may be able to be matched with logbooks but would require a deep dive.

Recreational fishing may occur more in areas that can be impacted by wind energy. In 2018, over 20,000 HMS permits were issued and there were more than 200 HMS tournaments. Some recreational catches are reported at the federal level, and some are reported at the state level (e.g., NC and MD).

Value of Fishery: Atlantic HMS recreational fishing is worth approximately $510 million. Although not readily available at the regional level and aggregated for all HMS species, in 2019 landings of tuna species alone by U.S. fishermen at ports in the United States, American Samoa, other U.S. territories, and foreign ports were 526.1 million pounds valued at $407 million. These tunas were also largely captured greater than 3 miles from shore.[9]

Data Snapshot: Years of available data are unknown.

Summary: Locational data may be difficult to determine from permits and reports. Landings and logbook data may contain some locational information, especially from commercial and tournament fishers. Pelagic survey and tagging could provide a proxy for species' distribution but aggregating that data to draw conclusions about impact may be difficult.

[9] https://media.fisheries.noaa.gov/2021-05/FUS2019-FINAL-webready-2.3.pdf?null=

American Lobster (*Homarus americanus)*

Commercial Fishery: The lobster commercial fishery is one of the most valuable fisheries along the US Atlantic Coast and is targeted primarily by pots. Historic stock numbers have fluctuated along the coast, but total commercial landings have steadily increased over the last three decades. Currently, Gulf of Maine/Georges Bank stock is at record high abundance, whereas Southern New England stock is depleted. Note: Lobster is harvested recreationally by pots and SCUBA, but overall recreational harvest is unknown and believed to be negligible compared to the commercial fishery.

Where: ME to NC, with most landings occurring in ME and northern New England.

Management: Cooperatively managed by the states and NOAA through the ASMFC. There are seven lobster conservation management areas (LMCA).

Harvest and Data Reporting: Federal VTR data varies by LCMA and NMFS Statistical Areas because VTRs were not historically required for vessels that did not hold other federal permits.

Since 2008, 100% dealer reporting at the trip level has been required in all states. State and federal dealer data includes statistics for value, landings, number of transactions, and port but generally cannot provide spatial data for where the lobsters were caught. For Maine, assumptions can be made for NMFS Statistical Area where lobsters were caught using dealer reported ports. Landings in other states cannot use the port as an approximation of area fished given the proximity of important ports to multiple areas, however, NMFS Statistical Areas, or smaller sub-areas, are reported in harvester reports to those states.

Since the early 2010s, 100% harvester logbook reporting has been required in all states except Maine. In most cases outside of Maine, this requirement to report to the state also applied to federal permit holders exempt from VTR reporting. In most states, these harvester logbooks can be used to characterize the spatial footprint of the fishery, including activity occurring in federal waters conducted by permit holders landing in that state, though it is generally limited to the large NMFS Statistical Area definitions. Spatial information was collected at the inshore State Statistical Reporting Area and/or NMFS Statistical Areas and LCMAs through 2020 and beginning in 2021, ten-minute square reporting, in addition to the traditional area reporting, became mandatory through ASMFC Addendum XXVI. This first year of higher resolution spatial data will become available for analysis later in 2022. For Maine, from 2008-2018, a randomly selected 10% of each zone and each license class were required to report via harvester logbooks. This changed to an optimized random selection in 2019. All states will require 100% harvester logbook reporting by 2023. A currently pending ASMFC Addendum XXIX may make vessel tracking mandatory for federal permits in the coming years.

For several states including Connecticut, Massachusetts, and New York, state harvester logbooks reported inshore State Statistical Reporting Areas, which in many cases are equivalent to NMFS

sub-areas, and/or NMFS Statistical Areas as spatial units prior to 2021. Others solely required NMFS Statistical Areas. In Maine, the available harvester logbooks provide a coarse resolution of reports by Maine Lobster Management Zone and distance from shore (0-3nm, 3-12nm, and 12nm+). To offer a gross characterization of the Maine lobster fishery, a spatial layer has been developed using a combination of the Maine dealer and harvester logbook data to extrapolate the landings, trips, and value by zone and distance from shore. As noted above, selection of the 10% sub-sample of the Maine fleet, prior to 2019, was not based on activity, so the number of licenses reported annually within each zone, especially outside of 12 nautical miles, varies from few to none so multiple years are necessary to estimate the offshore areas. This creates a patchwork of polygons that can characterize the intensity of annual landings, value, or trips per square mile, but is unable to describe the importance of some habitats over others. This assumption of equal distribution of the resource over large areas provides uncertainty around the extrapolation in Maine and nuanced or detailed spatial analyses beyond the NMFS Statistical Areas or sub-areas are not feasible in any region.

Value of Commercial Fishery: In 2021, the ex-vessel value for Maine alone was estimated to be $725 million lbs. In 2019, approximately 126 million lbs. were landed coastwide, representing $630 million in ex-vessel value. In 2016, landings peaked at 159 million pounds coastwide.

Data Snapshot: Data is available for ≥10 years. For most states (excluding Maine), 100% dealer and 100% logbook reporting have been required since 2010, but spatial information may be variable prior to 2021. For Maine, a spatial analysis tool using dealer and harvester logbooks can extrapolate some landing, value, and trips by zone and distance from shore, but has some uncertainty about habitat importance and equal distribution.

Summary: Federal VTR coverage is higher offshore, but lowest where the highest landings occur inshore (See figures A1 and A2 below). Dealer and harvest logbooks may provide some spatial coverage for most states. Maine's analysis tool can be useful but has some caveats.

Figure A1. Percentage Combined 2014-2018 Lobster Landings by Statistical Area. The landings by Statistical Area were estimated by states through the ASMFC Lobster Assessment process. The Lobster Conservation Management Area (LCMA) lines are included for reference.

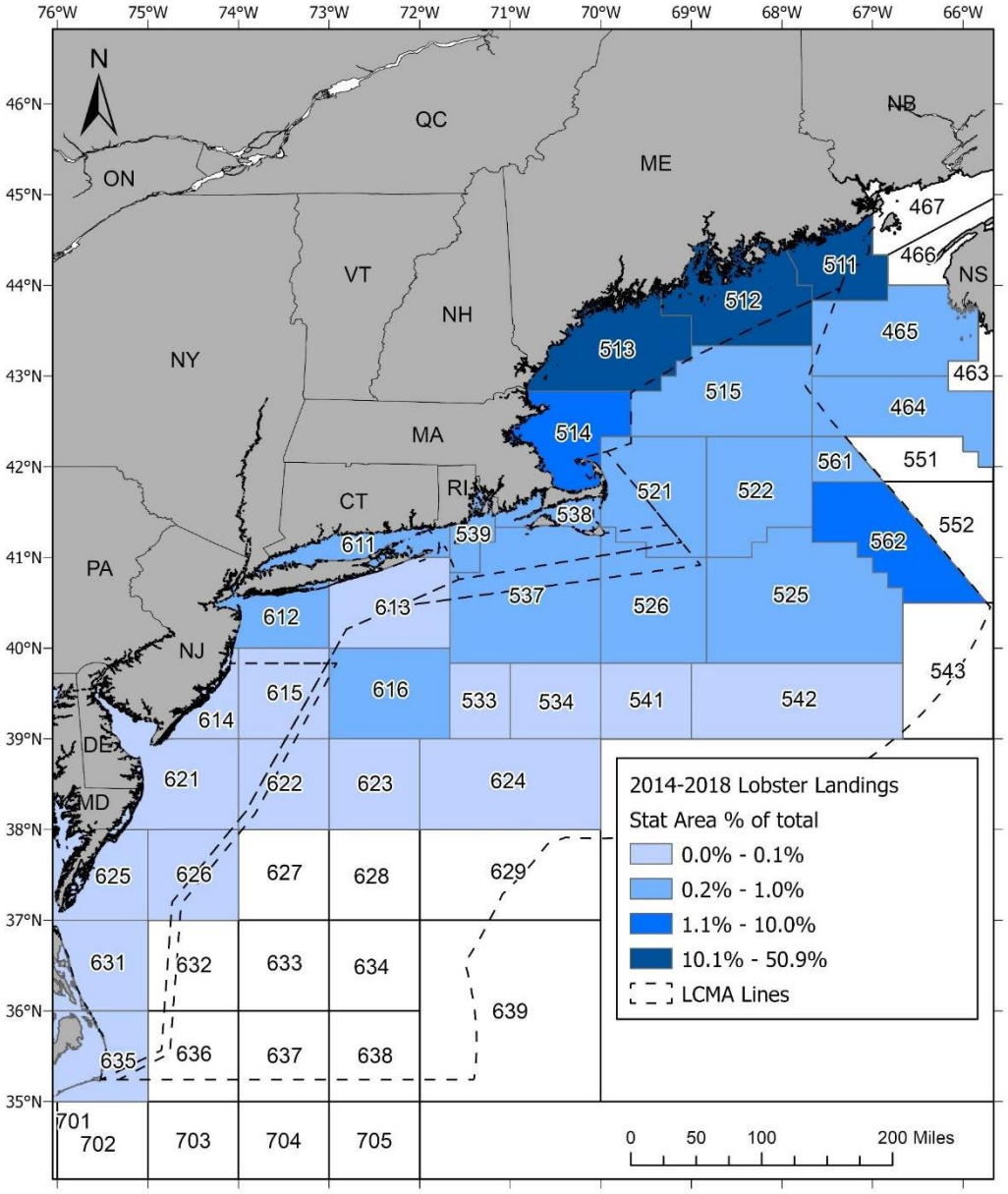

Figure A2. 2014-2018 combined VTR Landings/Total Landings by Statistical Area. Some areas were grouped: 533/534/541/542 and 620's/630's. Areas in hatched blue have VTR landings that are greater than the assigned total landings for those statistical areas and should be used with caution. LCMA lines are overlayed for reference.