Fisheries Baseline Analysis for Rhode Island for the SouthCoast Wind Brayton Point Export Cable Route and Rhode Island GLDs

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List of Abbreviations

COP – Construction and Operations Plan

ECA – Export Cable Area

ECC – Export Cable Corridor

ECR – Export Cable Route

ECC WA – Export Cable Corridor Working Area

ECRA – Export Cable Route Area

GLD – Geographic Location Description

GDP – Gross Domestic Product

MA DMF – Massachusetts Division of Marine Fisheries

NMFS – National Marine Fisheries Service

NOAA – National Oceanographic and Atmospheric Administration

PPI – Producer Price Index

RICRMC – Rhode Island Coastal Resources Management Council

RIDEM – Rhode Island Department of Environmental Management

SBRM – Standardized Bycatch Reporting Methodology

VMS – Vessel Monitoring System

VTR – Vessel Trip Report

WLA – Wind Lease Area

Summary

Based on NOAA data from 2008 to 2021 and adjusting for both underreporting of lobster and Jonah crab landings in the VTR data and some dockside sales of lobster and Jonah crab, we estimate the average annual value of commercial landings from the 180 m wide SouthCoast Wind Brayton Point Export Cable Area to be \$4,150/km^2/year (2023\$). Of this, about 48% is landed in Rhode Island.

For the intersection of the Brayton Point Export Cable Area and the 2011 and 2018 Rhode Island Geographic Location Description (GLD) areas, this amounts to annual landed value of \$28,700 (2023\$) in Rhode Island. Including indirect and induced effects, these landings generate \$46,000 in annual value in Rhode Island.

Rhode Island-based charter fishing revenue generated in and around the Brayton Point Export Cable Route Area is estimated to be between \$12,000 and \$19,000 (2023\$). Including multipliers, this generates total annual economic impacts of \$19,000 to \$31,000 in Rhode Island.

Introduction

This report estimates the level of pre-development Rhode Island-based fishing operations intersecting with, and landings and landed value from, the overlap of the SouthCoast Wind Brayton Point Export Cable Area (ECA) (Figure 1) and the 2011 and 2018 Rhode Island Geographic Location Description areas (GLDs) (A and B in Figure 2, respectively).

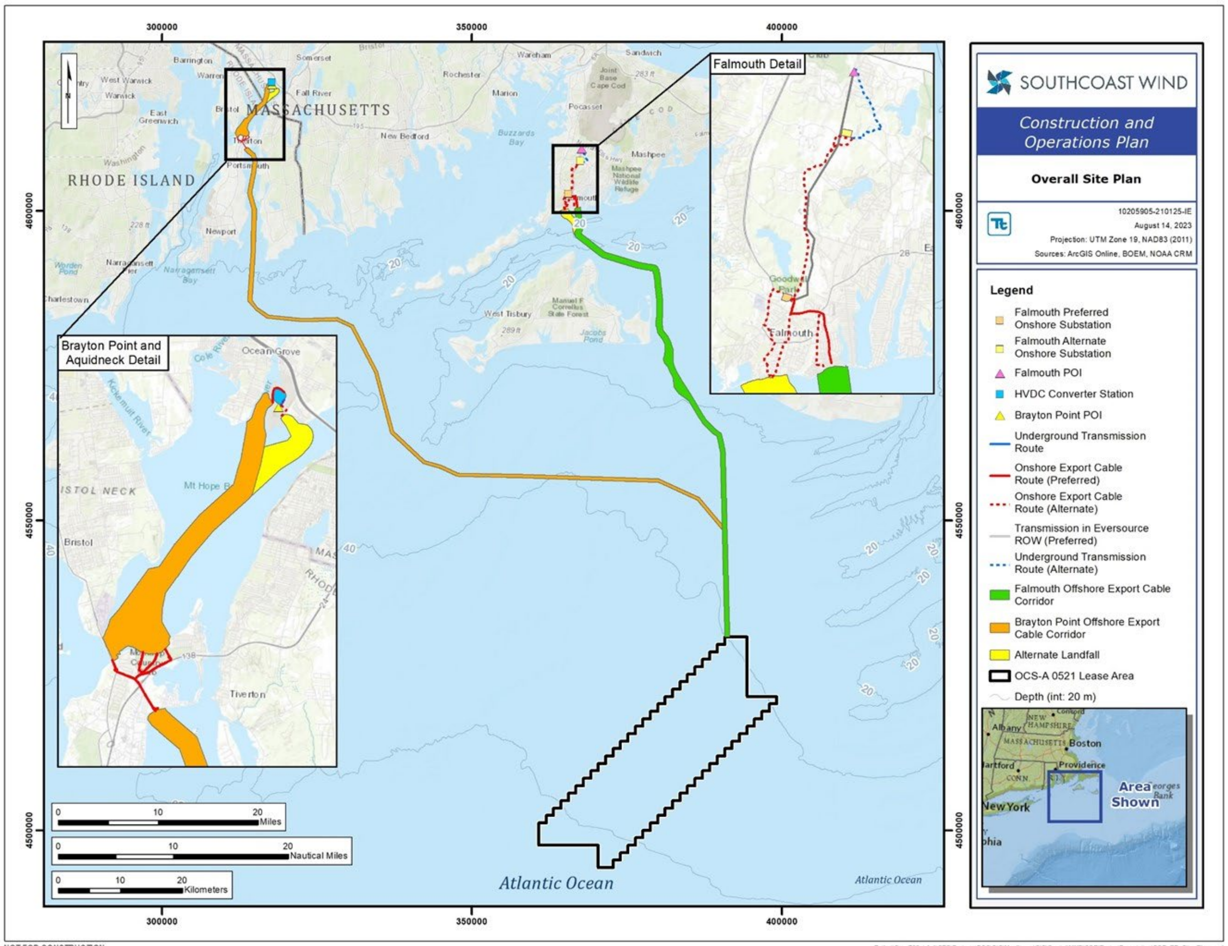

Figure 1. SouthCoast Wind Lease Area and Export Cable Corridors. Source: SouthCoast Wind.

The WLA for SouthCoast Wind (OCS-A 0521), which is outside the 2011 and 2018 RI GLDs, lies in federal waters, roughly 25 nautical miles south of Nantucket, and has a footprint of 516 km^2. The Brayton Point ECC is 103 km in length and runs from the northern edge of the WLA first to the north and west across Rhode Island Sound, then up the Sakonnet River to its landing location at Brayton Point in Somerset, MA. The Falmouth ECC, which is also outside the 2011 and 2018 RI GLDs, runs north from the WLA through the Muskeget Channel and then northwest across Nantucket Sound to Falmouth, MA.

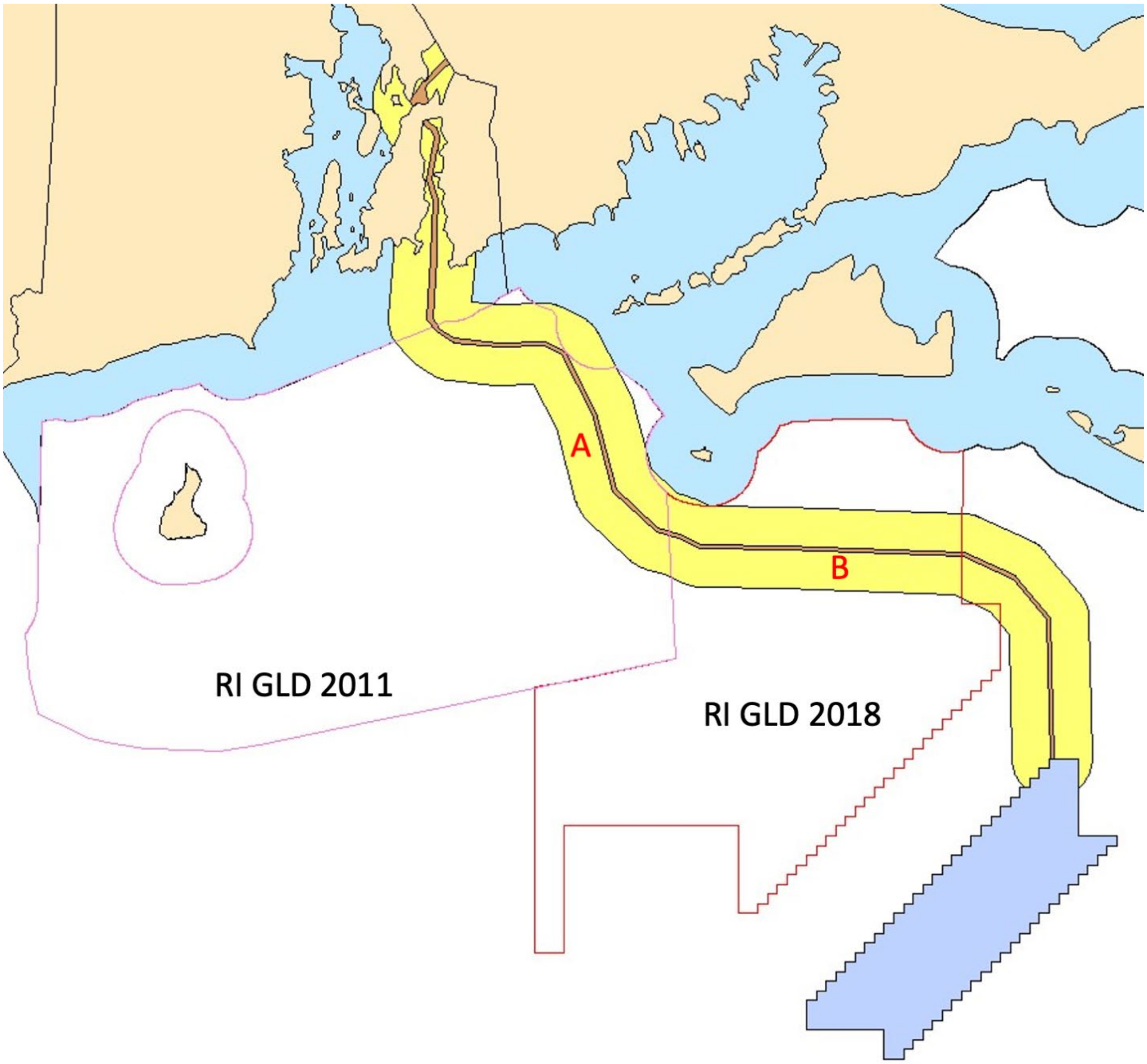

Figure 2. Brayton Point Export Cable Route and 2011 and 2018 RI GLDs. State waters are light blue; Export Cable Route Area (ECRA) in yellow.

To estimate commercial fish landings along the ECA, WHOI defined a 10 km-wide Export Cable Route Area (ECRA; yellow area in Figure 2) extending 5 km on either side of the cable route. The 10 km-wide ECRA has no physical significance in the context of the SouthCoast Wind Project, and is defined only for the purpose of identifying fisheries landings data that reflect what may be landed from fishing along the export cable route. Likewise, the Brayton Point Export Cable Corridor defined and surveyed by SouthCoast Wind is 700 m wide and represents the corridor within which the cables will be micro-sited and located. Only portions of the narrow 180 m wide ECA centered on the export cables are anticipated to be disturbed in the process of burying the cables.

Table 1 shows the approximate length and area of these features for the SouthCoast Wind Project. In the sections that follow, fishery landings and values for the Export Cable Route are estimated and reported for the ECA, as defined above.

Table 1. SouthCoast Wind area parameters

Wind Lease Area (WLA) footprint (km^2)	516
Brayton Point Export Cable Route (ECR) length (km)	148
ECR length in Rhode Island state waters (km)	34
ECR length in Rhode Island GLD 2011 (km)	44
ECR length in Rhode Island GLD 2018 (km)	37
Over-water footprint of 10km Brayton Point Export Cable Route Area (ECRA) (km^2)	1,331
Footprint of 180 m Brayton Point Export Cable Area (ECA) (km^2)	28.3
Brayton Point ECA footprint in Rhode Island state waters (km^2)	6.1

Methodology

Our approach to estimating the potential impact of SouthCoast Wind development on commercial fishing is to first estimate the annual landed weight and value of fish and invertebrates from the portion of the SouthCoast Wind Project Area that overlaps with the 2011 and 2018 Rhode Island GLD areas, and then to estimate the fraction of this annual value that may be exposed to wind farm construction, operation, and decommissioning. Our assessment method is consistent with the general framework described in the reports by Kirkpatrick *et al.*/BOEM (2017a and 2017b) on socio-economic impact of offshore wind energy development on commercial fisheries, and builds on the approach of Livermore (RIDEM 2017, 2018, and 2019), which develops high-end estimates of fishery impacts by including in baseline estimates the entire trip revenues from all trips that overlap with a wind lease area, regardless of how much fishing occurred inside or outside the area.

Separately, we estimate the gross revenue associated with for-hire charter boat fishing activity originating in Rhode Island, and the fraction of this revenue that may be exposed to SouthCoast Wind development within the RI GLD areas.

We estimate the annual commercial landings and landed value of fish from the SouthCoast Wind Project Area using a dataset provided by NOAA's National Marine Fisheries Service. This dataset uses modeled representations of federal Vessel Trip Report (VTR) and clam logbook fishing trip data to produce a more accurate spatial allocation of landings from each fishing trip (DePiper 2014; Benjamin *et al.* 2018). As we document below, there has been considerable variability in annual landings from these areas over the past decade; we use the average landings and landed value from 2008 to 2021 as indicative of what the areas may yield in the future.

Throughout this report, we use "landed value" to refer to the direct value of fisheries landings, "impact" to refer to the economic activity generated by fisheries, including indirect and induced effects (see below), and "exposure" to refer to the portion of landed value or impacts that may be at risk due to wind farm development.

Baseline commercial fishery landings and values, 2008-2021

Commercial Fisheries Data Description

NOAA has been collecting and improving their Vessel Trip Report (VTR) data for decades. The data have been widely used for fisheries research, management, and economic impact assessments. To gauge landings value and quantity at the spatial scale required for the SouthCoast Wind Lease Area and export cable route, NOAA has recently developed a procedure to produce high-resolution spatial information using a combination of VTR and fishery observer data. As described below, we follow the general approach developed by NOAA, which is the best approach at present, with a recognition that relevant data are not perfect. All estimates of fishery landings and values in this report are based on these NMFS data. The data have not been amended, adjusted, or augmented in any way, with two exceptions: we make adjustments to the lobster and Jonah crab landed values to account for possible underreporting; and we make adjustments to the Rhode Island lobster and Jonah crab landings to account for dockside sales. These adjustments are described in detail in the section on Adjustment of Lobster and Jonah Crab Data below. The adjusted data appear only in Tables 11 and 12 below.

The data presented below summarize estimates of fisheries landings and values for fishing trips that intersected with the SouthCoast Wind Brayton Point Export Cable Route Area (ECRA), from 2008 to 2021 (calendar years). Modeled representations of federal Vessel Trip Report (VTR) and clam logbook fishing trip data were queried for spatial overlap with the WLA and the ECRA and linked to dealer data for value and landings information. As detailed in DePiper (2014) and Benjamin *et al.* (2018), to improve the spatial resolution of VTR, a spatial distribution model was developed by combining vessel trip information from VTR with matching NOAA fishery observer data, including geocoordinates of detailed fishing locations. From this model, landings and value can be summarized for a specified geographic area according to (1) species, (2) gear type, (3) port of landing, and (4) state of landing.

In essence, the DePiper approach utilizes a spatial model to distribute the total landings for each commercial fishing trip over a circular area with its center located at the geocoordinate reported in the VTR, following a distribution decreasing with the radius. The model was estimated using VTR data (for the centroid) and vessel observer data (for haul beginning and endpoints). DePiper (2014) reported that the observer data matched VTR records well (488,251 hauls in the observer data were matched to 27,358 VTR records, representing 87.5% of all hauls with either a beginning or end point of a haul recorded).

The primary purpose of the observer data collection is to monitor fishery bycatch. NOAA's Standardized Bycatch Reporting Methodology (SBRM) dictates what types of vessels (gear, species, area of operation, etc.), participating in various fisheries, should be sampled and at what rate. The numbers of sea days needed to achieve a 30% coefficient of variation (CV = standard deviation divided by mean) of total discards for each species group were derived for different SBRM fleets covering different gears, access areas, states, and mesh sizes (NEFSC 2013). For Massachusetts vessels, the observer program covered close to 20% of trips with trawl gear, around 5% of trips with dredge gear, and around 20% of trips with gillnet gear (Jin 2015).

Following the DePiper approach, the resulting high spatial resolution data were converted into raster maps. Use of this VTR raster model produces a more accurate estimate of the spatial distribution of landings than other approaches that rely entirely on the self-reported VTR/clam logbook locations, which associate all landings from the trip with a single point location. At 10 nautical mile resolution, the confidence intervals of the DePiper model estimates are around 90% for trip lengths of one to two days.

The only alternative to the DePiper approach is a model to distribute the total landings from a VTR report over the vessel's track using the Vessel Monitoring System (VMS) data. The main challenge for this approach is accurate identification of fishing and non-fishing segments of a trip. Muench *et al.* (2018) have shown that using vessel speed alone can lead to a severe misrepresentation of fishing locations. NOAA has adopted the DePiper approach as a standard procedure to generate spatial data; and we agree with NOAA that this is the best approach currently available. The main advantages of the DePiper approach are that (1) it is based on observations of actual fishing locations noted by observers at sea, and (2) it provides a systematic and consistent way to meet the increasing demand for spatial fishing data for relatively small areas in the ocean, which is important for cross project comparison.

Landings associated with the Export Cable Area are calculated by applying the ratio of footprint areas shown in Table 1 to the landings estimated for the Export Cable Route Area. This assumes that landings are distributed uniformly across the fished sections of the ECRA.

In order to maintain the legally required data confidentiality, summaries by species, gear type, and landing location are presented individually. In addition, for records that did not meet the "rule of three" (three or more unique dealers and three or more unique permits), values are summarized in a category labeled "ALL OTHERS." Note also:

- All landed values have been converted to 2023 dollars using the Producer Price Index for "unprocessed and prepared seafood."
- Pounds are reported in Landed Pounds, unless otherwise noted.
- Data summarized here are from federal sources only.
- Fishing vessels that carry only lobster permits for federal waters are not subject to VTR requirements. Landings from trips with no VTR are not reflected in this summary.
- Other fisheries exist in state waters that may not be reflected in data from federal sources (e.g. whelk, quahog, striped bass).

We also obtained the average monthly number of trips intersecting with each area, for the period of 2008 to 2021.

Commercial Fishery Landings from the Brayton Point Export Cable Area

Table 2 shows the average annual level and standard deviation of total values and landings associated with fishing in the Brayton Point ECA from 2008 to 2021. Average annual landings from the Brayton Point ECA are about 61,000 lbs (standard deviation 30,000 lbs) with a value of $62,000 (standard deviation $16,000).

Table 2. Average annual value and quantity of commercial fisheries landings in Brayton Point ECA

Area	*Mean* Value/year (2023$)	Landings/year (lbs)	*Standard Deviation* Value/year (2023$)	Landings/year (lbs)
Brayton Point ECA	61,863	61,147	15,698	30,302

Table 3 shows the total landings and values, for each year from 2008 to 2021, associated with fishing in Brayton Point ECA.

Table 3. Annual value and quantity of commercial fisheries landings in Brayton Point ECA.

Year	Value (2023$)	Landings (lbs)
2008	77,946	74,342
2009	57,984	64,216
2010	50,824	77,621
2011	55,577	57,318
2012	61,841	92,477
2013	62,185	134,331
2014	61,786	71,599
2015	73,543	54,892
2016	99,625	75,375
2017	49,263	29,039
2018	39,125	21,311
2019	55,923	33,399
2020	44,583	31,145
2021	75,878	38,992

Table 4 summarizes the average annual landings and value of fisheries production from the Brayton Point ECA by the top species or species groups. American Lobster and Longfin squid are among the species generating the greatest value from the Brayton Point ECA during the 2008-2021 time period. Full data on landings by species can be found in Table A1 in the Appendix.

Table 4. Average annual landings of major species by area, 2008-2021.

Area/Species	***Mean*** **Value/year** (2023$)	**Landings/year** (lbs)	***Standard Deviation*** **Value/year** (2023$)	**Landings/year** (lbs)
Longfin Squid	15,786	10,329	11,259	7,264
American Lobster	12,770	1,958	3,052	453
Summer Flounder	6,373	1,540	2,111	666
ALL_OTHERS	4,948	5,596	3,037	4,131

Both mobile (e.g., trawl and dredge) and fixed (e.g., pots and gillnet) gears are used in fishing operations. The trawl gear is primarily used for harvesting groundfish, dredge for scallops, and pots for lobster and crabs. The fixed gears are fished using trawls (a series of lobster pots attached to one line) with string lengths of 0.4–0.8 km (up to 1.829 km) or gillnets with typical string lengths of 0.2–3.0 km. Table 5 breaks out annual landings for the Brayton Point ECA by gear type. Bottom trawls and lobster pots generate the most significant landings. The "ALL_OTHERS" category includes landings using purse seines, other seines, and weirs/traps, and others that fall under the "rule of three" exclusion.

Table 5. Average annual landings in the Brayton Point ECA by gear type.

Gear	***Mean*** **Value/year** (2023$)	**Landings/year** (lbs)	***Standard Deviation*** **Value/year** (2023$)	**Landings/year** (lbs)
ALL_OTHERS	2,207	2,540	3,707	4,665
Dredge – Clam	3,041	3,316	2,975	3,419
Dredge – Scallop	2,791	248	2,604	279
Gillnet – Sink	4,122	4,132	1,928	2,431
Handline	297	77	252	58
Longline – Bottom	-	-	-	-
Pot – Lobster	13,904	3,157	2,798	745
Pot – Other	3,526	716	1,576	363
Trawl – Bottom	29,879	31,729	12,362	10,455
Trawl – Midwater	2,096	15,231	3,209	23,313

Table 6 summarizes annual landings and landed value for the major ports receiving landings from the Brayton Point ECA.

Table 6. Average annual landings at major ports in Rhode Island and Massachusetts.

Area/Port	***Mean***		***Standard Deviation***	
	Value/year (2023$)	**Landings/year** (lbs)	**Value/year** (2023$)	**Landings/year** (lbs)
Brayton Point ECA				
Point Judith, RI	19,690	15,609	8,680	6,563
New Bedford, MA	17,143	24,085	5,883	19,869

Table 7 shows average annual landings and landed value from the Brayton Point ECA by state where the catch is landed. Rhode Island and Massachusetts together account for more than 90% of landings. The "others" category includes landings in Maine, New Hampshire, Connecticut, New York, New Jersey, Maryland, North Carolina, and Virginia, as well as data flagged by the "rule of three" exclusion.

Table 7. Average annual landings in the Brayton Point ECA by state.

State	***Mean***		***Standard Deviation***	
	Value/year (2023$)	**Landings/year** (lbs)	**Value/year** (2023$)	**Landings/year** (lbs)
Rhode Island	28,868	25,999	9,508	8,365
Massachusetts	27,635	31,305	7,675	24,392
Others	5,360	3,843	--	--

Landed Value and Trips by Month

Table 8 and Figure 3 show the average monthly landings and values from the Brayton Point Export Cable Area. Table 9 reports the average monthly number of fishing trips that intersect the ECA. Note that the trip numbers in Table 9 are for the 10 km wide ECRA, whereas the landed value shown in Table 8 and Figures 3 are for the 180 m wide ECA only.

Table 8. Average monthly value of landings, 2008-2021 (2023$).

Month	Brayton Point ECA
Jan	$ 2,397
Feb	$ 1,420
Mar	$ 1,350
Apr	$ 2,292
May	$ 5,285
Jun	$ 11,041
Jul	$ 13,092
Aug	$ 10,241
Sep	$ 6,150
Oct	$ 2,979
Nov	$ 2,598
Dec	$ 3,020

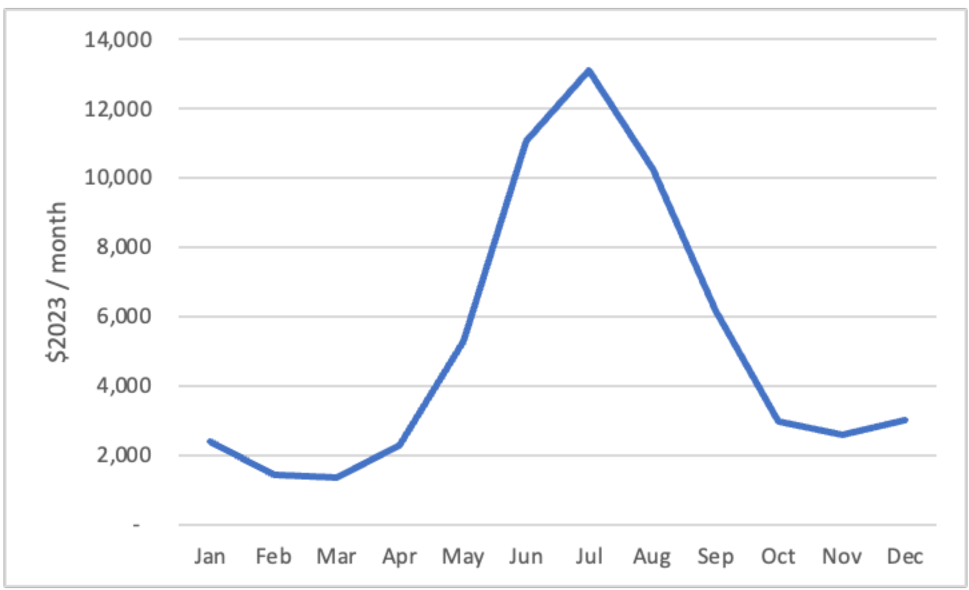

Figure 3. Average monthly value of landings, Brayton Point ECA, 2008-2021.

Table 9. Average monthly number of fishing trips, 2008-2021.

Month	Brayton Point ECRA
Jan	570
Feb	285
Mar	321
Apr	647
May	3,007
Jun	3,641
Jul	3,990
Aug	3,404
Sep	2,874
Oct	2,347
Nov	2,094
Dec	1,141

Inter-annual Price Adjustments

We use the Bureau of Labor Statistics' Producer Price Index (PPI) for "unprocessed and prepared seafood"[1] to convert ex-vessel value of fish landings, because this index is specifically for the fishery sector. PPI is a family of indexes that measures the average change over time in selling prices received by domestic producers of goods and services; they measure price change from the perspective of the seller. In contrast, the Bureau of Economic Analysis' general Gross Domestic Product (GDP) deflator[2] measures changes in the prices of goods and services produced in the United States, including those exported to other countries, and captures price changes across all economic sectors. Table 10 shows both indexes from 2000 to 2021.

Note that the variation in the sector (i.e., fishery) specific price index is considerably larger than that of the GDP deflator. PPI decreases have been observed in several years since 2000. The GDP deflator exhibits a steady trend. We recognize that many seafood prices rose sharply in 2021, as reflected by the sharp increase in fish PPI for that year. We consider it unlikely that this will significantly alter the long-term trend and maintain that the historical average is the best predictor of future values.

We report all values in 2023$ for consistency. These values can be easily adjusted to any other year-dollars by applying the appropriate index adjustment. Landed value may be adjusted using the PPI index. For impact values, including upstream and downstream effects (see below), it is more appropriate to use the GDP deflator to adjust, because the multipliers capture economy-wide impacts.

[1] https://www.bls.gov/ppi/#data
[2] https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2#reqid=19&step=2&isuri=1&1921=survey

Table 10. Price indexes.

Year	GDP implicit price deflator	Percent change	PPI fish	Percent change
2000	78.0		198.1	
2001	79.8	2.25%	190.8	-3.69%
2002	81.0	1.56%	191.2	0.21%
2003	82.6	1.97%	195.3	2.14%
2004	84.8	2.68%	206.3	5.63%
2005	87.5	3.14%	222.6	7.90%
2006	90.2	3.09%	237.4	6.65%
2007	92.6	2.70%	242.8	2.27%
2008	94.4	1.92%	255.4	5.19%
2009	95.0	0.64%	250.9	-1.76%
2010	96.2	1.20%	272.4	8.57%
2011	98.2	2.08%	287.6	5.58%
2012	100.0	1.87%	287.6	-0.02%
2013	101.8	1.75%	299.4	4.12%
2014	103.7	1.87%	322.4	7.68%
2015	104.7	1.00%	322.0	-0.13%
2016	105.7	1.00%	327.6	1.74%
2017	107.7	1.90%	337.9	3.15%
2018	110.3	2.39%	344.5	1.96%
2019	112.3	1.79%	349.9	1.55%
2020	113.6	1.21%	350.8	0.27%
2021	118.8	4.49%	413.0	17.74%
2022	127.1	7.04%	440.7	6.71%
2023	130.9	3.00%	431.1	-2.19%
Annual average		2.28%		3.53%

Adjustment of Lobster and Jonah crab Data

As noted above, lobster vessels that carry only lobster permits are not subject to a Vessel Trip Report (VTR) requirement. Trips without VTR are not reflected in the numbers shown in Tables 2 through 9 (cf. King 2019). To account for potentially unreported lobster and Jonah crab landings, and for dockside sales (see below), we make adjustments to the landed value data as shown in Table 11. Data in the first three rows are based on VTR data and are taken from Table 2 and Table A1 in the Appendix. An earlier study by Industrial Economics (2015) indicates that active lobster vessels not subject to VTR requirements in Lobster Management Area 2 may account for as much as 57% of the total lobster fishing activity in that area. (Lobster Management Area 2[3] encompasses the waters south of Rhode Island and Cape Cod to a distance of about 40 nm and overlaps with the SouthCoast Wind Project areas.) We assume conservatively that landings from 60% of the lobster vessels in the SouthCoast Wind ECRA could therefore be unreported, and that the VTR data represent 40% of the true lobster and Jonah crab

[3] http://fisheries.noaa.gov/resource/map/lobster-management-areas

revenues. We use this as an adjustment factor and estimate the adjusted lobster and Jonah crab revenues at 2.5 times of those in the VTR data.

Some fraction of lobster and Jonah crab landings are sold directly from boats at dockside, at a price above that reported in the dealer information on which the NOAA values above are based. The fraction of landings sold in this way and the price premium are not known exactly. Based on information provided by a group of Rhode Island fishermen (pers. comm., 24 Nov. 2020), we estimate that a 15% premium on the landed value derived from NOAA data (Table 11) adequately captures this dockside sales effect for Rhode Island landings. Dockside sales are not a common practice in Massachusetts (Mass. DMF pers. comm. May 2021), so we do not apply this multiplier to Massachusetts landings.

The combined adjustment for VTR data and dockside sales is shown in rows 5 and 6 in Table 11. The net increase is shown in row 7, and the adjusted total annual landed values are shown in row 8. This adjustment results in a 37% increase in the estimated total annual landed value for the Brayton Point ECA.

Table 11. Adjustment of landed value for landings not captured in VTR data and for RI dockside sales.

Value (2023$)	**Brayton Point ECA**
Avg. VTR total $/year (Table 2)	61,863
Avg. VTR lobster $/year (Tables A1-A3)	12,770
Avg. VTR Jonah crab $/year (Tables A1-A3)	941
% of total captured by VTR	40%
Adjusted lobster $/year (incl. RI dockside sales)	34,160
Adjusted Jonah crab $/year (incl. RI dockside sales)	2,518
Net increase over VTR $/year (row 5+6-2-3)	22,967
Adjusted total $/year	84,830
Adjusted increase over VTR total value	37.1%

With all adjustments, we estimate the average annual landed value in Rhode Island from the Brayton Point ECA to be about $41,100 (2023$). Assuming that this value is evenly distributed over the federal waters portion of the ECA, the fraction attributable to the intersection of the ECA and the two RI GLDs 2011 and 2018 (Figure 2) is $28,700.

Estimated Indirect and Induced Economic Impacts

Economic impact multipliers reflect the linkages between economic activity in different sectors of the economy. For example, when landings increase in the commercial fishing sector, there is an associated increase in the purchases of ice and other supplies in the region, and an increase in onshore transportation and processing of seafood. The resulting increases in economic activity in the commercial fishing supply and transportation and processing sectors are indirect effects of increased landings. In addition, because fishermen and workers in the supply, transportation, and processing industries earn greater income as a result of this increased activity and spend some of that extra income on local goods and services, there is also an induced effect of greater spending in other sectors. The multipliers capture the combined effect of indirect and induced spending that results from higher commercial landings.

We have developed regional economic models for Rhode Island using the IMPLAN model software (IMPLAN 2004) and data for 2021. IMPLAN software and data are commercial products widely used by researchers and management agencies to perform economic impact analyses for a user specified study region (IMPLAN 2004; Steinback and Thunberg 2006; Hoagland *et al.* 2015; UMass Dartmouth 2018; Cape Cod Commission 2020). IMPLAN was initially developed for the US Forest Service. It is a modular input-output model that works down to the individual postal zip code level for most zip codes in the United States. The IMPLAN database consists of two major parts: (1) a national-level technology matrix and (2) estimates of sectoral activity for final demand, final payments, gross output, and employment for each zip code. This 546-sector gross-domestic-product-based model divides the US economy into sectors based on North American Industry Classification System codes[4], and is based on the US Commerce Department's national input-output studies, the national income data, and related Federal economic surveys. In IMPLAN, national average technology coefficients are used to develop the direct coefficients for sectors at local levels. As noted, we use 2021 IMPLAN data for Rhode Island for our analysis. Based on the 2021 model and data, the upstream output multiplier for the commercial fishing industry in Rhode Island is 1.311.

We have also taken into account downstream economic activity, such as seafood processing, that may take place at Rhode Island businesses as a result of commercial fisheries landings. This linkage is less direct than the upstream activities, because not all seafood landed in a state is processed in the state, and seafood processors may import more seafood from elsewhere for processing when in-state landings fall short. Nonetheless, we add a downstream adjustment of 0.511, using 2021 IMPLAN data, to the multiplier for Rhode Island landings, bringing the combined multiplier to 1.822, to account for both upstream effects and downstream effects to seafood processors. We apply the combined upstream and downstream multiplier to all landings except lobster and Jonah crab, which are adjusted for dockside sales and receive only the upstream multiplier.

The economic impact multiplier captures the linkages between the fishing industry sector and other sectors in the Rhode Island economy. While we use a single output multiplier for the entire commercial fishing sector in a given state, we recognize that the multiplier may in fact vary across specific fisheries, species, and gear due to differences in factor inputs for fishing operations and post processing of fish landed. We use a single multiplier for the entire commercial fishing sector, reflecting an average across all gear types and species. Economy-wide inflation affects all sectors in the economy but usually does not alter the general structure of the economy. Therefore, although the baseline economic values increase with rising prices, the multiplier does not. We also recognize that other types of multipliers, such as those focusing on employment effects, have been used in other analyses. We maintain that the output multipliers we use provide a robust and accurate measure of indirect and inducted effects averaged across the fishing sectors.

[4] https://www.census.gov/naics/

Table 12. Estimated annual economic impact in Rhode Island (all values in 2023$)

Area	State	Average value of landings/year			Total impact/year
		VTR data only (Table 11, row 1)	with lobster & Jonah crab adjustment	with dockside sales adjustment (15% premium on RI lobster & JC landings)	"dockside sales" column multiplied by upstream & downstream multipliers, except RI lobster & JC
Brayton Point ECA	total	61,863	82,430	84,830	149,528
Brayton Point ECA	RI	28,868	38,654	41,101	64,902

Using these multipliers and including the lobster and Jonah crab adjustment described in the previous section, we estimate the average annual total economic impact from commercial fishing activity in the Brayton Point ECA to be about $149,500 overall and $64,900 in Rhode Island. The portion attributable to Rhode Island-based commercial fishing in the intersection of the ECA with the RI GLDs amounts to an annual impact in Rhode Island of $46,000 (2023$). These estimates are based on average annual landings value from 2008 to 2021, with lobster and Jonah crab landed value adjusted to account for boats not subject to VTR requirements.

Rhode Island-Based Charter Fishing

To obtain data on for-hire charter fishing activity in and around the Brayton Point Export Cable Corridor, we conducted an online survey of Rhode Island- and Massachusetts-based charter vessel operators. The survey asked operators to identify their fishing locations on a chart, and report for each location:

- the total number of annual for-hire fishing trips that vessel took in each of the years 2017-2021,
- the average number of passengers onboard for-hire trips in each of the years 2017-2021, and
- the average amount of time spent targeting highly migratory species (HMS) relative to bottom fishing or trolling for other species during for-hire trips.

The survey was first distributed on April 18, 2022 through email lists maintained by Rhode Island Department of Environmental Management (RIDEM), Rhode Island Coastal Resources Management Council (RICRMC) and Massachusetts Division of Marine Fisheries (MADMF), and also via email by for-hire fishing industry representatives, including the Rhode Island Party and Charter Boat Association. The survey was active from April 18, 2022 until May 14, 2022. The survey received 91 total responses from for-hire charter owners and/or operators. Sixty-six of these respondents (72%) reported that they fish in the area depicted in Figure 4. These 66 respondents reported 62 unique vessels and reported effort data for 29 of those vessels across the five-year period of 2017-2021 (black dots in Figure 4).

Table 13. For-hire charter fishing survey summary statistics.

Description	Number
Fished in the area and responded to the survey	70
Provided vessel names	66
of which based in Rhode Island	28.5
Provided annual vessel trip numbers	35
Observations with vessel trips reported (2017-2021)	229
Total trips per year	1 – 235
Average total trips per year	46.74
Passengers per vessel trip	2 – 25
Average passengers per vessel trip	5.24
Identified fishing locations on maps	33
of which based in Rhode Island	14.5

To capture for-hire effort focused specifically within and around Narragansett Bay, a second survey was conducted in October 2022 distributed among 17 for-hire charter captains known to fish primarily in Narragansett Bay as identified by members of the for-hire industry. This survey received a total of 4 responses reporting activity for 4 unique vessels not captured in the first survey wave (red dots in Figure 4). The second survey design was identical to that of the first wave with the addition of charts for Narragansett Bay. Combined results for the two surveys are shown in Table 13.

Similar studies published in the peer-reviewed academic literature using paper mail, email, or mixed mode survey distributions typically have survey response rates around 20-30% (e.g., Dalton *et al*. 2020, Carr-Harris and Steinback 2020). Based on discussions with for-hire industry representatives, approximately 100 vessels actively engage in for-hire fishing activity in the waters depicted in Figure 4, suggesting the fishing reported by survey respondents accounts for about 33% of the total. The combined response rate for the primary population of interest is within an appropriate range to consider our survey distribution a success. An important note to also consider is that there are vessels in our sample that require the submission of federal VTRs. A common trend identified in the data was that some respondents did not provide data for their vessels that require VTRs. This is not a problem for this analysis as this effort data is already accounted for by the NOAA databases and summary reports used as a baseline for our subsequent analyses.

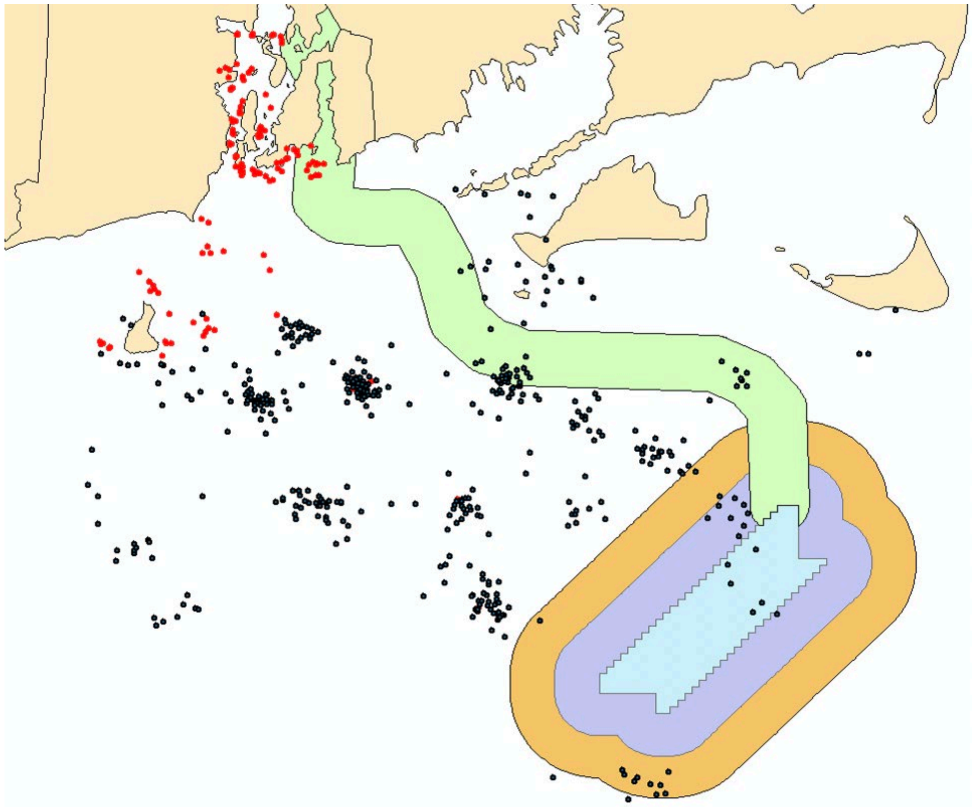

Figure 4. Charter fishing locations, 2017-2021, identified in survey responses. WLA is shown in blue with 7.5 and 15 km buffers, and Brayton Point ECRA in green. Black dots: first survey; red dots: second survey (see text above).

The number of anglers per year is estimated by multiplying the vessel trip number in a year and the average number of anglers per trip in that year for each vessel, and the results are then summed across vessels by area. Table 14 shows the annual vessel trips and angler counts in the survey responses for charter vessels based in Rhode Island.

Table 14. Number of Rhode Island-based vessel trips and anglers by year, Brayton Point ECRA.

	State waters		Federal waters	
Year	**Vessel Trips**	**Anglers**	**Vessel Trips**	**Anglers**
2017	22	77	11	48
2018	16	56	14.5	63.5
2019	18	58.5	14	65
2020	17	51	5	15
2021	10	30	7	25
Average	***16.6***	***54.5***	***10.3***	***43.3***

We use the revenue per angler estimates from NOAA shown in Table 15 below for our revenue calculation. We recognize that the per angler revenue from charter boats may be an order of magnitude larger than that from party boats. The data in Table 15 represent an average across both sectors, influenced by the fact that many more people participate in party boat fishing than in charter fishing. There is no per-angler revenue data specific to the SouthCoast Wind Project area available from NOAA as of the writing of this report. We therefore rely on estimates from nearby lease areas (Bay State Wind and Vineyard Wind 1) as a proxy of what we expect SouthCoast Wind Project area revenues to be.

The annual revenue for each area is estimated by multiplying the number of anglers (Table 14) by the average revenue per angler ($116.23). The result is then adjusted using a scale factor. For a low-end estimate, the scale factor is the ratio of the number of Rhode Island vessels responding to the survey (28.5) to the number of these vessels for which specific fishing locations were provided (14.5). For a high-end estimate, we increase the scale factor to reflect the estimated total of 100 vessels operating in the survey area (see above), versus the 66 for which survey responses were received. Finally, an economic impact multiplier is used to reflect the overall economic impacts associated with the charter fishing direct revenue. As with commercial fishing, we recognize that this multiplier will in fact vary with different types of charter fishing (e.g. sport fishing charters versus party boats). The multiplier we use is calculated using data in the NOAA report by Lovell *et al*. (2020), and reflects an average across different types of charter fishing. The results are shown in Table 16 for the federal waters portion of the Brayton Point ECRA, which overlaps with the RI GLDs.

Table 15. Estimated SouthCoast Wind Project area for-hire vessel revenue. Sources: NMFS 2023a and 2023b

Year	**Revenue per angler** (2023$)
2009	111.50
2010	92.92
2011	159.29
2015	134.57
2016	106.19
2018	92.92
Average	**116.23**

Table 16. Annual revenue and economic impact from RI-based charter fishing in federal waters and RI GLDs.

Area	**Annual anglers**	**Revenue per angler** (2023$)	**Scale factor**	**Annual revenue** (2023$)	**Impact multiplier**	**Annual impact** (2023$)
Brayton Point ECRA	43.3	116.23	2.333	11,743	1.622	19,047
Federal Waters			3.763	18,940	1.622	30,721

Conclusions

Based on NOAA data from 2008 to 2021 and adjusting for both underreporting of lobster and Jonah crab landings in the VTR data and some dockside sales of lobster and Jonah crab, we estimate the average annual value of commercial landings from the 180 m wide SouthCoast Wind Brayton Point Export Cable Area to be \$4,150/km^2/year (2023\$). Of this, about 48% is landed in Rhode Island.

For the intersection of the Brayton Point Export Cable Area and the 2011 and 2018 Rhode Island Geographic Location Description (GLD) areas, this amounts to annual landed value of \$28,700 (2023\$) in Rhode Island. Including indirect and induced effects, these landings generate \$46,000 in annual value in Rhode Island.

Rhode Island-based charter fishing revenue generated in and around the Brayton Point Export Cable Corridor is estimated to be between \$12,000 and \$19,000 (2023\$). Including multipliers, this generates total annual economic impacts of \$19,000 to \$31,000 in Rhode Island.

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Appendix

Table A1. Average annual landings by species from the SouthCoast Wind Brayton Point ECRA, 2008-2021.

Note: lobster and Jonah crab data in this table have not been adjusted for landings not reported via VTR. (These data are for the 10 km wide ECRA, not the 180 m wide ECA.)

	Mean		***Standard Deviation***	
Species	**Value/year** (2023 $)	**Landings/year** (lbs)	**Value/year** (2023 $)	**Landings/year** (lbs)
ALBACORE TUNA	2,303	1,428	6,986	4,210
ALL_OTHERS	274,877	310,907	168,718	229,521
AM. PLAICE FLOUNDER	268	136	246	123
AMERICAN EEL	16	5	38	9
AMERICAN LOBSTER	709,460	108,796	169,582	25,185
AMERICAN SHAD	2	2	5	4
ATLANTIC CROAKER	18	32	41	84
ATLANTIC HALIBUT	38	4	30	3
ATLANTIC HERRING	138,611	952,673	206,077	1,417,581
ATLANTIC MACKEREL	12,614	39,171	16,993	80,425
BLACK SEA BASS	109,272	23,662	35,050	10,251
BLUE CRAB	1,391	1,407	4,937	5,040
BLUEFIN TUNA	5	1	17	3
BLUEFISH	30,407	41,417	17,979	27,093
BLUELINE TILEFISH	15	5	40	13
BONITO	8,242	2,681	5,958	2,277
BUTTERFISH	28,548	33,437	15,989	17,949
CANCER CRAB	-	57	-	130
CHANNELED WHELK	105,555	10,840	68,262	7,459
CHUB MACKEREL	11	12	43	45
COBIA	1	0	3	1
COD	6,972	2,295	4,622	1,450
CONCHS	13,436	2,679	35,331	6,551
CONGER EEL	283	391	281	434
CUNNER	266	110	746	260
CUSK	4	3	5	4
DOGFISH SMOOTH	3,330	4,777	2,694	4,493
DOGFISH SPINY	20,572	68,345	28,651	91,918
DOLPHINFISH	4	1	17	4
FOURSPOT FLOUNDER	22	42	55	123
GOLDEN TILEFISH	5,048	1,070	5,599	1,161
HADDOCK	1,808	1,223	1,414	1,036
HORSESHOE CRAB	217	197	197	224
ILLEX SQUID	1,867	3,599	2,881	6,328
JOHN DORY	89	63	122	85
JONAH CRAB	52,297	55,260	30,697	31,883
KING MACKEREL	0	0	1	0
KING WHITING	2,152	1,946	4,176	3,954
KNOBBED WHELK	1,765	446	2,928	708

LIGHTNING WHELK	153	49	463	137
LITTLE TUNA	1,962	3,257	2,864	5,089
LONGFIN SQUID	877,015	573,828	625,512	403,553
MAKO SHORTFIN SHARK	-	-	-	-
MENHADEN	119	315	221	642
MONKFISH	62,175	29,835	33,865	12,183
MULLETS	-	-	-	-
NK CRAB	82	78	129	89
NK EEL	21	18	27	20
NK SEATROUT	137	300	148	350
NK TILEFISH	-	-	-	-
NORTHERN KINGFISH	0	0	0	0
NORTHERN SEA ROBIN	0	2	2	8
OCEAN POUT	5	8	18	28
OCEAN QUAHOG	-	-	-	-
OFFSHORE HAKE	1,740	1,757	4,157	3,908
OTHER FISH	49	50	181	179
POLLOCK	289	236	233	209
RED CRAB	-	-	-	-
RED HAKE	6,178	16,464	1,668	4,760
REDFISH	151	196	139	169
ROCK CRAB	6,522	8,240	7,927	9,230
SAND TILEFISH	-	-	-	-
SAND-DAB FLOUNDER	53	79	131	205
SCUP	142,379	168,197	63,861	79,535
SEA RAVEN	61	40	75	46
SEA ROBINS	178	496	202	356
SEA SCALLOP	155,767	13,132	141,862	13,922
SILVER HAKE	102,572	139,468	51,088	77,190
SKATES	139,206	665,273	75,862	449,248
SPANISH MACKEREL	6	4	15	11
SPOT	6	11	15	28
SPOTTED HAKE	-	8	-	29
SPOTTED WEAKFISH	16	5	34	11
SQUETEAGUE WEAKFISH	1,468	592	1,213	465
STRIPED BASS	9,125	1,772	8,622	1,726
SUMMER FLOUNDER	354,034	85,559	117,270	37,004
SURF CLAM	3,836	3,561	12,526	11,688
SWORDFISH	-	-	-	-
TAUTOG	7,409	1,998	3,390	1,034
THRESHER SHARK	60	53	226	197
TRIGGERFISH	145	90	96	56
WHITE HAKE	1,310	747	3,154	1,664
WINTER FLOUNDER	18,568	6,471	20,051	7,502
WITCH FLOUNDER	353	142	344	140
WOLFFISHES	3	3	8	6
YELLOWFIN TUNA	-	-	-	-
YELLOWTAIL FLOUNDER	11,896	5,598	16,996	8,847