

DRAFT

**Clam Dredge Framework Adjustment
Including a Draft Environmental Assessment**

September 14, 2018

**Prepared by the New England Fishery Management Council
in consultation with the National Marine Fisheries Service**

Final Council action:

Preliminary submission:

Final submission:

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1 Executive summary

[Summarize background and purpose, alternatives considered, and impacts of the alternatives on the ecosystem]

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3 Background and Purpose

3.1 Need and purpose for action

The Council is developing this framework to evaluate and possibly designate areas where hydraulic clam dredging might continue in the Great South Channel Habitat Management Area (GSC HMA). The purpose of the HMA is to minimize, to the extent practicable, the effects of regional fisheries on essential fish habitat (EFH). The purpose of this action is to identify areas where fishing for surfclams with hydraulic dredges would have only minimal and temporary impacts on the habitats in the HMA. This action is needed to comply with the Magnuson-Stevens Fishery Conservation and Management Act requirement to minimize the effects of fishing on EFH to the extent practicable.

3.2 Management background

The Council previously worked to identify and minimize impacts to essential fish habitat is detailed in Omnibus Essential Fish Habitat Amendment 2 (OHA2). OHA2, including designation of the GSC HMA, was partially approved in January 2018 and implemented on April 9, 2018. The GSC HMA was designated as a closure to all mobile bottom-tending gears (MBTG). MBTG are defined in the fishery regulations for the northeastern United States as “gear in contact with the ocean bottom, and towed from a vessel, which is moved through the water during fishing in order to capture fish, and includes otter trawls, beam trawls, hydraulic dredges, non-hydraulic dredges, and seines (with the exception of a purse seine).” OHA2 grants a one-year exemption from this restriction for hydraulic dredges only that will expire on April 9, 2019, one year from the effective date of the OHA2 final rule.

3.3 Framework development process

During the development of OHA2, the Council acknowledged the importance of the GSC HMA to the surfclam dredge fishery. The Council took final action on OHA2 over a span of two meetings held in April and June 2015. The Council initiated this framework adjustment in September 2015, identifying a problem statement for the action. The problem statement below is modified from the original Council motion, which included reference to an additional HMA on Georges Shoal. The Georges Shoal HMA was not approved by NOAA Fisheries and will not be designated as part of OHA2.

“The SC/OQ fishery will be granted a one-year exemption for the Great South Channel Habitat Management Area (HMA) following implementation of OHA2, which will allow NEFMC to consider development of an access program for this fishery. The Council intends through this action to identify areas within the HMA that are currently fished or contain high energy sand and gravel that could be suitable for a hydraulic clam dredging exemption that balances achieving optimum yield for the SC/OQ fishery with the requirement to minimize adverse fishing effects on habitat to the extent practicable and is consistent with the underlying objectives of OHA2.”

Following identification of the problem statement, the Habitat Plan Development Team began work to assemble data to support the identification and evaluation of clam dredge exemption areas. These data include many typical fishery dependent and independent sources, such as logbooks, vessel monitoring system, dealer, and Northeast Fishery Science Center trawl and clam dredge surveys. The PDT also sourced images and habitat classification data from the School for Marine Science and Technology at the University of Massachusetts Dartmouth and augmented the existing database records for these images with percent cover data for gravel sediments and attached epifauna. An industry-based clam dredge survey was completed in the northern part of the GSC HMA during August 2017. The survey gathered information on clam distribution and abundance by size, as well as other components of the catch, including other shellfish species, epifaunal organisms, and gravel sediments by grain size.

The Committee met in April and May 2018 to discuss development of alternatives and recommended a range of exemption area measures to the Council at the June 2018 meeting. Given concerns that these alternatives might not meet the goals and objectives of the action, the Council remanded the framework back to the Committee for further development. The Council requested that both clam and mussel industry members suggest potential exemption areas by early August 2018; proposals were received in time for the August 2018 Committee meeting. At this time the Committee requested further development of a subset of the exemption areas proposed for clam dredges.

Additional information on development of alternatives and information to support framework.

4 Management Alternatives

4.1 Identify exemption areas where hydraulic clam dredges can be used

The alternatives in this section would identify exemption areas where hydraulic clam dredges could continue to be used. Under No Action, the exemption for hydraulic dredges will expire on April 9, 2019. Under the action alternatives, the Council would designate subsets of the GSC HMA where clam dredges would be permitted.

4.1.1 Alternative 1/No Action

No exemption areas are designated, and the entire GSC HMA will be designated as a MBTG closure beginning on April 9, 2019.

4.1.2 Alternative 2 (requires further development)

Some combination of areas identified by the surfclam industry, including the McBlair area, Rose and Crown Area, and Areas A, B, and D, in a rotational framework with closure periods of at least 7 years. The PDT and Committee will further develop this alternative during fall 2018.

4.2 Identify exemption areas where mussel dredges can be used

The alternatives in this section would identify exemption areas where mussel dredges can be used. This gear was prohibited in the GSC HMA beginning on April 9, 2018. The mussel industry first expressed their interest in fishing in the HMA in January 2018, upon learning that the area would close to mussel dredges upon final implementation of OHA2.

4.2.1 Alternative 1/No Actions

Mussel dredges are prohibited throughout the HMA.

4.2.2 Alternative 2 (requires further development, if the Council wishes)

No exemption areas have been developed at this time. The Committee recommended that an experimental fishery be conducted first.

4.3 Additional monitoring requirements for any designated exemption areas

The alternatives in this section could impose additional monitoring requirements when fishing in an exemption area within the GSC HMA.

4.3.1 Alternative 1/No Action

There would be no additional monitoring requirements. Clam dredge vessels will continue to use approved VMS units with hourly pings and submit logbooks for clam catches and vessel trip reports for catches of other species. Vessels would be required to carry fisheries observers if notified.

4.3.2 Alternative 2 (requires further development)

Clam dredge vessels would be subject to enhanced VMS polling within three miles of the habitat management area boundary. Logbook and observer requirements would remain as-is. Enhanced VMS monitoring means that when a clam dredge vessel authorized to fish in the HMA comes within three miles of the area, 5-minute polling is automatically initiated.

4.4 Sunset provisions

The alternatives in this section relate to the planned expiration of dredge exemption areas.

4.4.1 Alternative 1

Exemption areas would continue indefinitely with no specified end date. The Council could modify these areas in a future action, but no schedule would be set at the time of designation.

4.4.2 Alternative 2 (requires further development)

Exemption areas would revert to closures two years from their implementation date, unless reaffirmed by the Council in a subsequent management action. The later management action could eliminate the exemption areas, modify them, or continue them as-is. The intention is that additional fine-scale fishing effort and habitat distribution data would be used to inform development of this future management action.

5 Affected Environment

This information builds on the OHA2 FEIS, Volume 1, §4. There is a specific focus on the habitats and species found in and around the Great South Channel HMA, which are expected to benefit from habitat conservation measures, and on the surfclam fishery, which would be subject to the fishing restriction alternatives and therefore would bear the costs of these measures.

5.1 Physical setting including benthic habitats

This section focuses on the environment within and in the immediate vicinity of the Great South Channel Habitat Management Area. Further information about habitat types found throughout New England the Mid-Atlantic can be found in OHA2, Volume 1, §4.2.1. Appendix A to this framework describes the approach used to assess benthic habitat distributions based on drop camera image data.

5.1.1 Oceanography of the Great South Channel and Nantucket Shoals

The Great South Channel is an undersea channel between the shallower Nantucket Shoals and Georges Bank. A steady coastal current flows south along the east coast of Cape Cod's forearm and into the Great South Channel (Miller et al 1998). Some of this current flows south around Nantucket Shoals, while some turns east and joins the northeastward flow along the northern flank of Georges Bank. Strong currents are driven by a combination of winds and tides. Three large marine ecosystem persistent fronts are located in the region (Belkin et al 2009).

Describe currents in more detail, any changes observed in the system over time (see Harris et al. 2012, Dalyander et al. 2013)

Figure 1 – Ocean currents of the Georges Bank-Gulf of Maine region. Source: Miller et al. 1998.

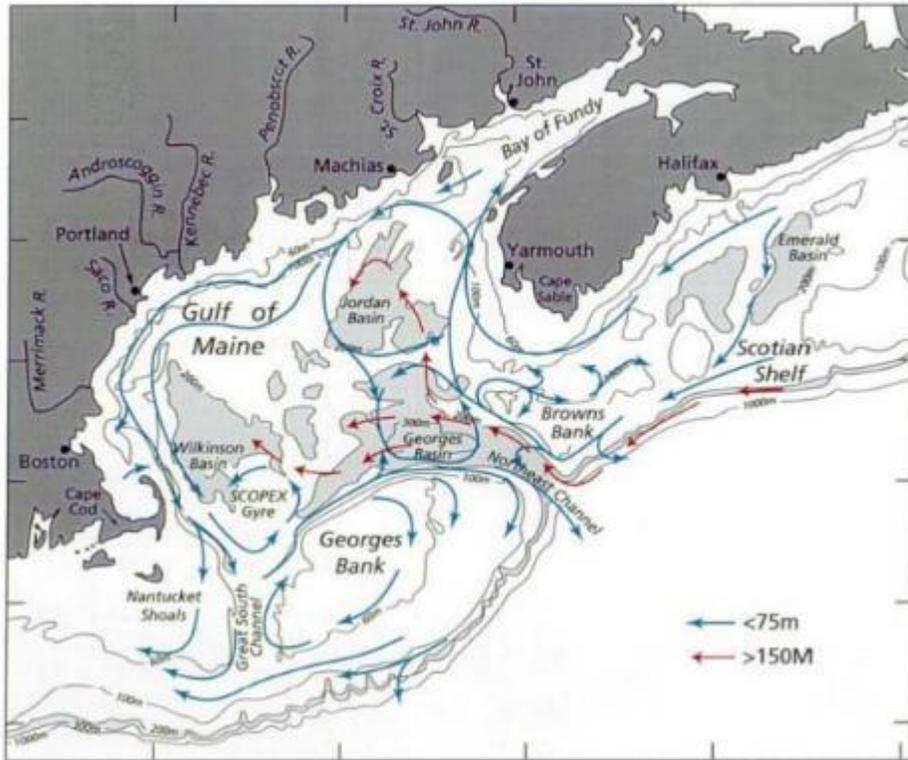
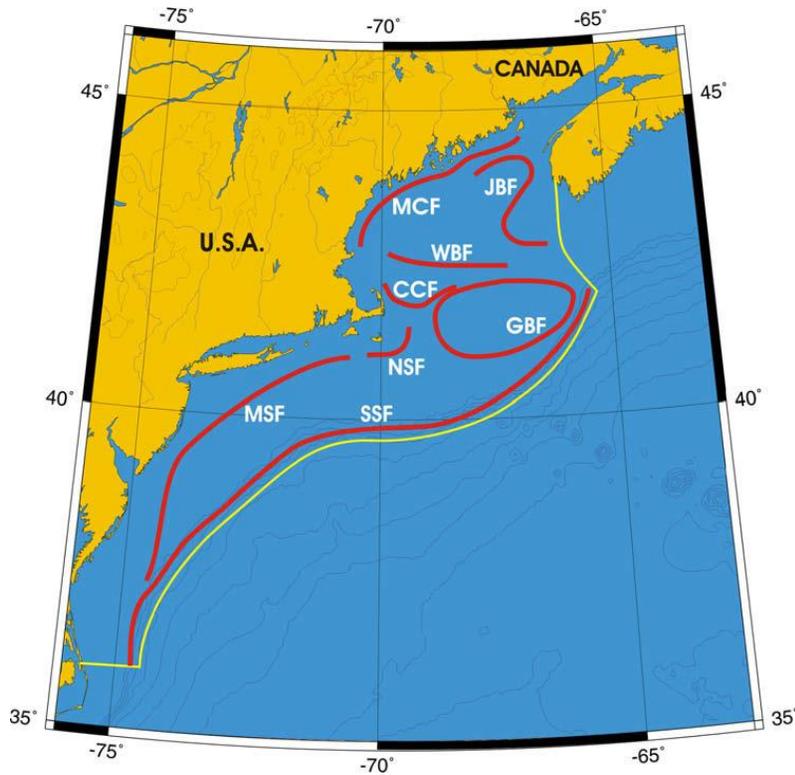


Figure 2 – Fronts of the Northeast US Continental Shelf Large Marine Ecosystem. The Cape Cod Front, Nantucket Shoals Front, and Georges Bank Front occur in the Great South Channel region. Source: Belkin et al 2009.



5.1.2 Benthic habitat characteristics

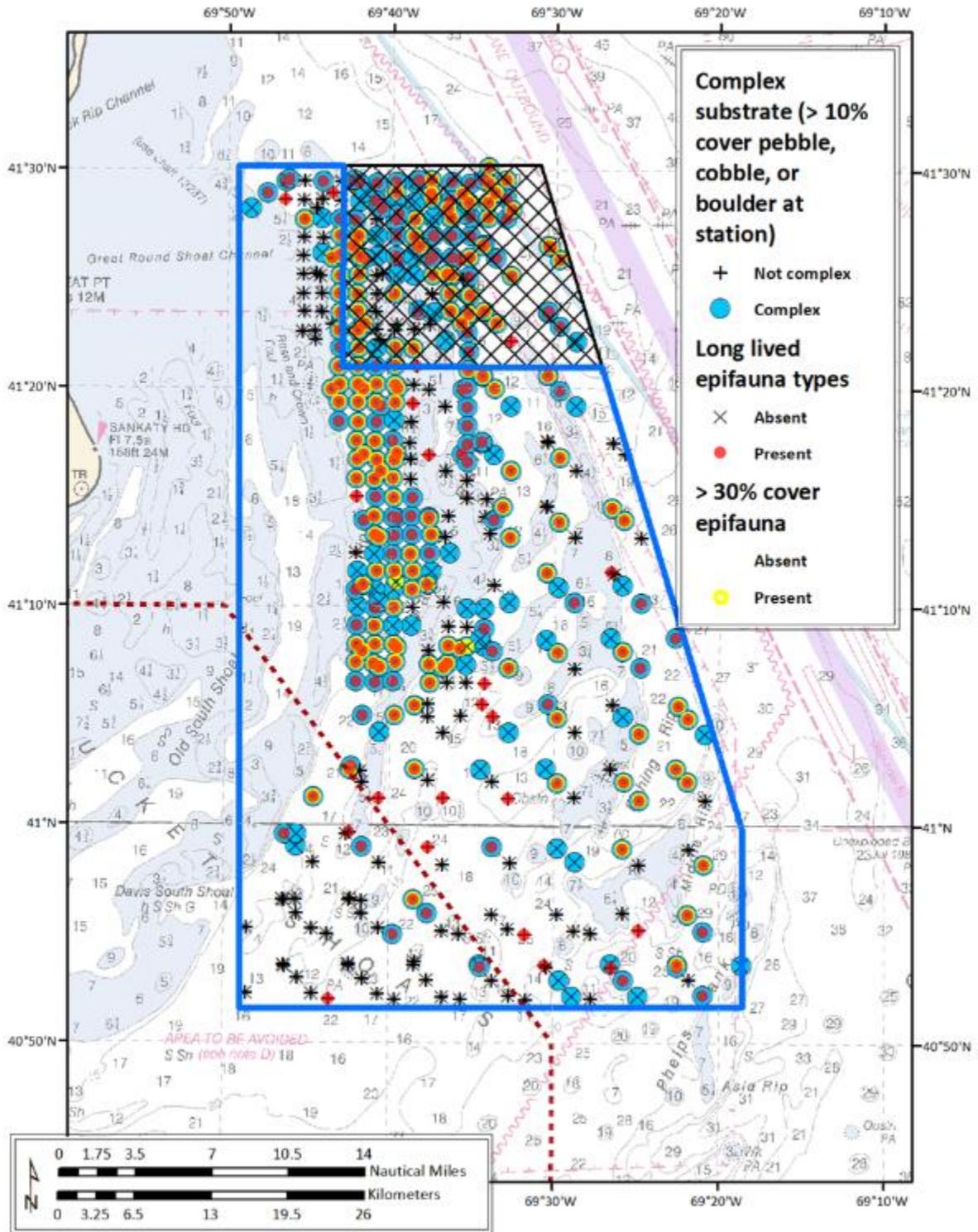
The function of the GSC HMA as fish habitat is related partially to benthic habitat characteristics, including sediments and bedforms (geological features) as well as biota (biological features).

To support this framework, the PDT reanalyzed image data used to develop the underlying sediment grid for the SASI model/OHA2. The methods used are detailed in Appendix A. Briefly, digital images were examined to confirm presence or absence of sand, pebble, cobble, or boulder. When one or more size classes of gravel were present, percent cover of all gravels combined was estimated. Percent cover was assessed as <10% coverage, 10-30% coverage, and >30% coverage, with at least 10% coverage of gravel used as a basic definition of complex habitat. Areas of gravel pavement with cover >80% were also flagged. The PDT also confirmed the presence of specific epifauna types in each image, and flagged images that have presence of specific long-lived taxa or have very high density of epifauna (>30%). Epifauna included tube-dwelling amphipods, anemones, ascidians, brachiopods, bryozoans, sea pens, hydroids, macroalgae, epifaunal bivalve mollusks, tube-dwelling polychaete worms, and sponges. The stalked ascidian *Boltenia ovifera* and finger sponge *Isodyctia* spp. were flagged as long-lived taxa. Stations with complex habitat and long lived and/or high coverage of epifauna are shown

on Map 1. These complex geological and biological features are concentrated in certain locations, but generally occur throughout the HMA.

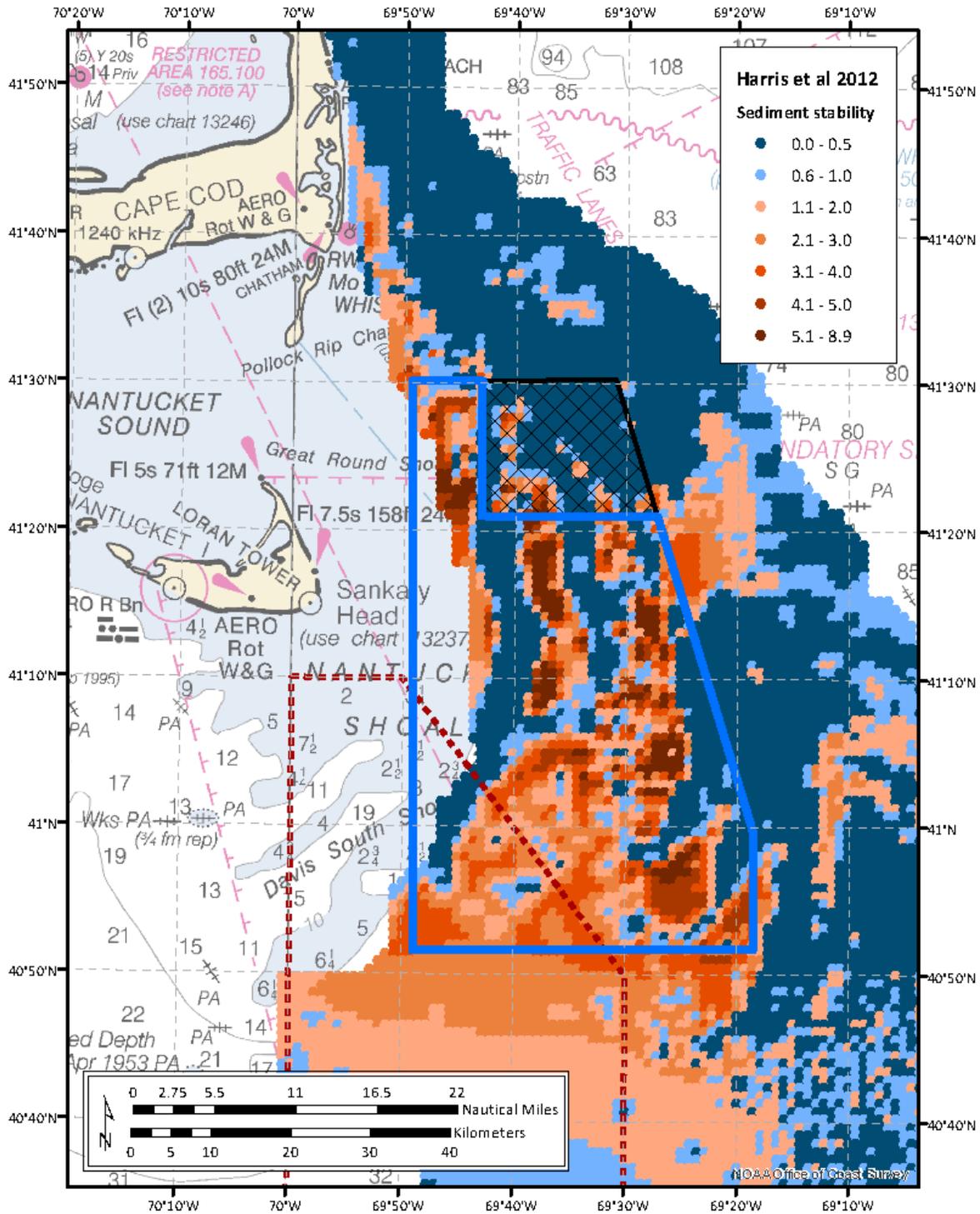
Sedimentary, epifaunal (living on the surface of the seabed or attached to sediments), and infaunal (living within the sediment) characteristics of the HMA were also documented in hydraulic clam dredge surveys. *Discuss results of Powell et al 2016 and Powell et al 2018 reports.*

Map 1 – Stations with complex habitat and long lived and/or high coverage of epifauna, based on reanalysis of drop camera images



The Habitat Amendment FEIS also examined sediment stability in the HMA. Benthic boundary shear stress ($N \cdot m^{-2}$) refers to the force per unit area exerted on the seabed by flowing water. Critical shear stress is the force needed to move a particle of a given size (sand, pebble, cobble, etc.). The ratio of shear stress to critical shear stress was used by Harris *et al.* (2012) to map stable benthic sediments on Georges Bank (Map 2). A ratio less than 1 would indicate that the sediment is stable because the shear stress in the environment would be less than the critical shear stress, thus creating stable points for the attachment of structure forming organisms. Sediments are predicted to be more stable in the mobile bottom-tending gear closure, with an average sediment stability index of 0.69 ($< 1 =$ stable) vs. an average index of 2.0 in the clam exemption area. A similar analysis of bottom shear stress in the Great South Channel/Southern New England region was developed by Dalyander *et al.* (2013), although they did not estimate sediment stability. *Discuss this issue in more detail, including theories of sediment movement in mixed beds.*

Map 2 - Sediment stability. Values of 1 or less (shown in blue) indicate stable sediments. Source: Harris et al., 2012.



Clam Dredge Framework - Map credit: NEFMC - Date: April 2, 2018

5.2 Benefits of habitat management areas and the effects of fishing gear

This section describes the links between fish habitats and resource productivity, and the effects that fishing gears, specifically clam dredges, can have on benthic habitats. This information builds on the literature review and analysis completed for OHA2 (Volume 1, §4.1.1, §4.2.2, as well as the Swept Area Seabed Impact Analysis, Appendix D). Appendix B to this framework includes a more detailed and updated literature review of the effects of clam dredges on benthic habitats.

5.2.1 Linkages between habitat and fish productivity

The HMA designations developed in OHA2 were based on the understanding that structured habitats enhance groundfish resource productivity by increasing the survival and growth of juveniles (see OHA2 FEIS, Volume 1 §4.1.1). Complex, highly-structured benthic habitats are relatively rare in continental shelf waters and are used by many species to reduce predation risk and provide food (Caddy 2008; 2013). Field studies conducted in shallow water show that survival rates of juvenile cod were higher in more structured habitats (e.g., in vegetation or rocky reefs and on cobble bottoms) where they find refuge from predators (Linehan *et al.* 2001; Tupper & Boutilier 1995). Laboratory experiments performed in habitat types of varying complexity with and without predators present have confirmed that juvenile cod, especially young-of-the-year juveniles, survive better in more structured habitats where they are less susceptible to predation (e.g., Borg *et al.* 1997; Gotceitas *et al.* 1995; Lindholm *et al.* 1999). Evidence that complex habitats enhance the survival of juvenile fish in other habitat types is provided by research done in sandy bottom habitats in the Mid-Atlantic Bight. Similar habitat types exist on Georges Bank and in southern New England and in areas of sandy sediment in the Gulf of Maine (Auster *et al.* 1995; Auster *et al.* 1998; Langton *et al.* 1995). In these habitats, structure is provided by bedforms (sand waves) of varying heights and biogenic structure such as animal tubes, shell and shell aggregation, or pits created by various species (Steves & Cowen 2000; Sullivan & Cowen 2006). Diaz *et al.* (2003) found more fish associated with larger bedforms that had some biogenic structure. Proximity of complex and simple habitats was important in providing refuge from predators in more complex habitats during the day and foraging opportunities in simpler habitats at night. Such diel patterns of habitat use would be expected to enhance survival and growth.

Despite general knowledge that relationships between habitat and survival and growth exist, determining the appropriate spatial extent of habitat management areas to be protected to improve resource productivity is not a straightforward exercise. There are many reasons for this, but one is that stock production rates by habitat are not generally known, such that increases in stock production associated with a certain type of habitat management cannot be quantified. Nonetheless, patterns of species occurrence in the Great South Channel HMA are known, as are the basic habitat requirements of these species. Those with a moderate or high degree of overlap between their designated EFH and the HMA include Atlantic cod, windowpane flounder juvenile, winter flounder, yellowtail flounder, little skate, winter skate, Atlantic sea scallop, and Atlantic herring (Table 1 has information about the habitats used by these species). Cod

spawning grounds identified by fishermen also occur in and around the HMA (DeCelles *et al.* 2017).

Table 1 – NEFMC-managed species found in the Great South Channel HMA

Species and life-stage	Degree of overlap between EFH and HMA	Species assoc. with complex substrate ¹	Species positively weighted in OHA2 hotspot analysis ²	One or more stocks overfished	Substrate features of EFH
Atlantic cod juvenile	High	X	X	X	YOY: inshore, prefer gravel and cobble habitats and eelgrass beds after settlement, but also utilize adjacent un-vegetated sandy habitats for feeding; also settle on sand and gravel on Georges Bank. Older juveniles: structurally-complex habitats, including eelgrass, mixed sand and gravel, and rocky habitats (gravel pavements, cobble, and boulder) with and without attached macroalgae and emergent epifauna
Atlantic cod adult	Moderate	X		X	Structurally complex hard bottom habitats composed of gravel, cobble, and boulder substrates with and without emergent epifauna and macroalgae
Windowpane flounder juvenile	Moderate			X	Mud and sand substrates
Windowpane flounder adult	High			X	Mud and sand substrates
Winter flounder egg	Moderate	X		X	Eggs are adhesive and deposited in clusters on mud, sand, muddy sand, gravel, and submerged aquatic vegetation, especially in areas with reduced bottom current where they are not buried by suspended sediment settling to the bottom
Winter flounder juvenile	High			X	Variety of bottom types, such as mud, sand, rocky substrates with attached macro algae, tidal wetlands, and eelgrass
Winter flounder adult	High	X		X	Muddy and sandy substrates, and on hard bottom on offshore banks, for spawning
Yellowtail flounder juvenile	Moderate			X	Sand and muddy sand
Yellowtail flounder adult	Moderate			X	Sand, shell hash, muddy sand, and sand with gravel

Species and life-stage	Degree of overlap between EFH and HMA	Species assoc. with complex substrate ¹	Species positively weighted in OHA2 hotspot analysis ²	One or more stocks overfished	Substrate features of EFH
Little skate juvenile	High	X			Sand and gravel, also found on mud
Little skate adult	Moderate	X			Sand and gravel, also found on mud
Winter skate juvenile	High	X			Sand and gravel, also found on mud
Winter skate adult	High	X			Sand and gravel, also found on mud
Atlantic sea scallop - all	Moderate	X			Pelagic larvae settle on any hard surface, including shells, pebbles, and gravel; they also attach to macroalgae and other benthic organisms such as hydroids, but do not survive on shifting sand.
Atlantic herring egg	High	X			Deposited on the bottom in beds, stick to coarse sand, pebbles, cobbles, and boulders and/or on macroalgae
¹ Species and life-stages that may occur on gravel sediment types ² Since the purpose of the analysis was to identify areas that were vulnerable bottom habitat, only stocks that either “occur in a variety of substrates including gravels” or had “strong affinity for coarse or hard substrates” were given non-zero weights.					

5.2.2 Fishing gear interactions with benthic habitats

5.2.2.1 Clam dredges

Hydraulic clam dredges are used to capture surfclams and ocean quahogs in sand and mixed sand, gravel, cobble, and boulder habitats by injecting highly pressurized water (varying from 50 lbs per square inch (psi) in coarse sand to 110 psi in finer sediments) into the sediment to a depth of 8-10 inches, depending on the coarseness of the sediment and the amount of water pressure needed to dislodge the clams from the bottom. These dredges have negative impacts on benthic habitats that are more than minimal and not temporary. These effects are detailed in Appendix B, and in the SASI document and vulnerability assessment (NEFMC 2011, Grabowski et al. 2014).

In terms of effects on geological features of the seabed, the dredge creates a trench up to 30 cm deep and as wide as the dredge with mounds along the sides. Fine sediments are resuspended in the water column, creating a turbidity cloud that dissipates quickly. The trenches degrade within a few months to the point when they are no longer visible. This process occurs more quickly in shallow water environments that are more exposed to strong bottom currents and the effects of wave action (e.g., storms). However, dredge tracks were still partially detectable with side-scan sonar in sandy substrate at a depth of 70-80 meters 5 and 10 years after dredging. Sediments in the trench are resorted, with larger grain sizes at the bottom and fine sediments at the top, with

the loss of burrows and tubes created by infaunal invertebrates. Sand that resettles in the trench is fluidized and remains fluidized for more than three months.

Regarding effects on biological organisms, benthic animals are dislodged from the sediment, or damaged by the dredge, significantly reducing the numbers, biomass, and species diversity of invertebrates in dredge tracks. While recovery of short-lived infaunal species can be rapid (several months to a year), some types of organisms (e.g., longer-lived epifauna that attach to hard substrates) take longer to recolonize the bottom than others. In the study done in 70-80 meters, smaller and more opportunistic species recolonized the dredge tracks sooner, meaning that it could take several years before biological communities return to predredge conditions, especially in deeper, more stable environments. In areas that are exposed to intensive, repeated clam fishing, recovery of physical and biological habitat features will be delayed until the area is depleted of clams and dredging moves to other areas.

Published studies of the habitat effects of hydraulic clam dredges focus on infaunal species in soft bottom habitats. Scoring of habitat vulnerability that was done by the Habitat PDT for the SASI model focused on epifaunal invertebrates, not infauna. The PDT ranked the severity of hydraulic clam dredge impacts well above those associated with other types of fishing gear (impacts in coarser cobble and boulder sediments were not assessed but will be when the model is updated). Impacts from a single dredge tow were estimated to cause, on average across all habitat features, a 50-75% loss in habitat functionality, with recovery times for geological features of 1.5-2.5 years in sand and 2-4 years in gravel, and 3-4.5 years for biological habitat features. In the absence of published studies on epifauna, this assessment relied heavily on knowledge of the life histories of organisms that would likely be affected by the gear in sand and gravel habitats (e.g., soft vs hard-bodied, height off the bottom, growth rates, and longevity). Susceptibility scores were high because the gear has such a disruptive effect on the bottom. Recovery times were only slightly higher for hydraulic clam dredges operating in sand and gravel habitats than for bottom trawls and scallop dredges.

5.2.2.2 Mussel dredges

To be completed

5.3 Managed resources and their Essential Fish Habitat

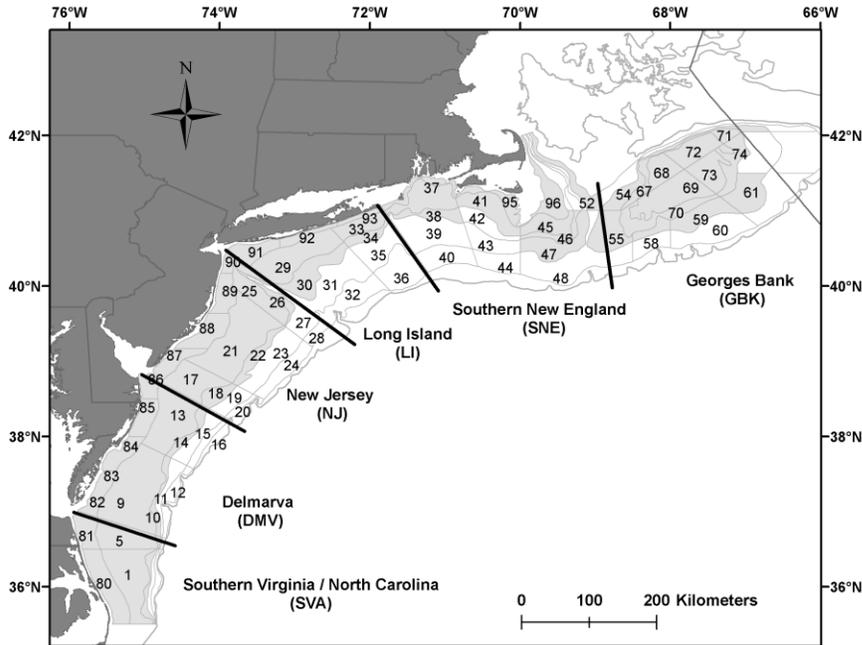
The managed resources described here are those that may be impacted by the alternatives under consideration, either because they are harvested using hydraulic dredges or because their Essential Fish Habitat overlaps the areas of the alternatives (Table 1). This expands upon and updates the overview provided in OHA2, Volume 1, §4.3. Overviews of the resources and their management are provided.

5.3.1 Atlantic surfclam

Distribution and life history: Atlantic surfclam (*Spisula solidissima*) is a bivalve mollusk distributed along the western North Atlantic Ocean from the southern Gulf of St. Lawrence to Cape Hatteras. Surfclams occur in both the state territorial waters (≤ 3 mi from shore) and within the EEZ (3-200 miles from shore; Figure 3). Commercial concentrations are found primarily off

New Jersey, the Delmarva Peninsula, and on Nantucket Shoals and Georges Bank. In the Mid-Atlantic region, surfclams are found from the intertidal zone to a depth of about 60 meters (197 ft), but densities are low at depths below 40 meters (131 ft).

Figure 3 - Surfclam stock assessment regions and NEFSC shellfish survey strata



Notes: The shaded strata are where surfclams are found.

Source: Dan Hennen Pers. Comm., NEFSC 2018, as cited in MAFMC (2018a).

Information on Atlantic surfclam biology can be found in the document, “Essential Fish Habitat Source Document: Surfclam, *Spisula solidissima*, Life History and Habitat Requirements” (Cargnelli *et al.* 1999). Additional information on this species is available at: <http://www.fishwatch.gov>.

The greatest concentrations of surfclams are usually found in well-sorted, medium sand, but they may also occur in fine sand and silty fine sand. Surfclams can live to over 30 years of age and 15 to 20-year-old clams are common. The maximum size of surfclams is about 22.5 cm (8.9 inches) shell length, but surfclams larger than 20 cm (7.9 inches) are rare. Surfclams are capable of reproduction in their first year of life, although full maturity may not be reached until the second year. Eggs and sperm are shed directly into the water column. Recruitment to the bottom occurs after a planktonic larval period of about three weeks.

Atlantic surfclams are suspension feeders on phytoplankton and use siphons which are extended above the surface of the substrate to pump in water. Predators of surfclams include certain species of crabs, sea stars, snails, and other crustaceans, as well as fish predators such as cod and haddock.

Population status: The Atlantic surfclam stock was last assessed in July 2016 (SAW 61; NEFSC 2017a). A statistical catch at age and length model called Stock Synthesis was used. Reports on “Stock Status,” including assessment and reference point updates, SAW reports, and Stock Assessment Review Committee (SARC) panelist reports are available online: <http://www.nefsc.noaa.gov/saw>. The Great South Channel HMA is within the Southern New England region described in the assessment, although parts of the HMA are not sampled in the federal survey used to inform that assessment. The central and northern portions of the Great South Channel HMA were surveyed in August 2017 (Powell *et al.* 2018).

Overall, the assessment indicated that the Atlantic surfclam resource continues to remain above its biomass target, and fishing mortality remains below the F_{MSY} threshold. Atlantic surfclams are ***neither overfished nor subject to overfishing*** (NEFSC 2017a).

New reference points were developed for SAW 61 which are more justified scientifically. The new biomass reference points and measures of stock biomass are ratios rather than absolute biomass in weight. This approach allows for conclusions about the status of the surfclam stock despite substantial uncertainty in the actual biomass of the stock.

SAW 61 concluded that the Atlantic surfclam stock was not overfished in 2015 (NEFSC 2017a). Based on recommended reference points for the whole stock which use spawning stock biomass (SSB), estimated $SSB_{2015}/SSB_{Threshold} = 2.54$ (probability overfished < 0.01). For surfclam, SSB is almost equal to total biomass. Trends expressed as the ratio $SSB/SSB_{Threshold}$ are more reliably estimated than SSB. For the whole stock, relative SSB ($SSB/SSB_{Threshold}$) declined during the last fifteen years but is still above the target.

Overfishing did not occur in 2015 (NEFSC 2017a). Based on new recommended reference points, estimated $F_{2015}/SSB_{Threshold} = 0.295$ (probability overfished < 0.01). Trends expressed as the ratio $F/F_{Threshold}$ are more reliably estimated than absolute fishing mortality rates. For the whole stock the trend in relative F ($F/F_{Threshold}$) generally increased during the last fifteen years (despite recent declines in the south) but is still below the threshold.

Trends expressed as the ratio of recruitment (R) and mean recruitment in an unfished stock (R_0) are more reliably estimated than absolute recruitment (NEFSC 2016). The trend in relative recruitment is measured using the ratio R/R_0 . Recruitment generally increased over the last decade, and in 2015 R/R_0 was 0.57 in the north, 0.97 in the south, and 0.75 for the stock, indicating recruitment in 2015 was about 57%, 97% and 75% of the maximum long-term average in the three regions. These recruitment patterns are probably normal in a surfclam stock at relatively high biomass and with low fishing mortality. Recruitment for the whole stock is measured as the geometric mean of R/R_0 in the northern and southern areas and is more uncertain than estimates for either area.

The relationship between depth and biological parameters for surfclam was explored during SAW 61 and the results are described in §1.6 of the assessment report (NEFSC 2017a). The report comments that the distribution and biology of Atlantic surfclam may be changing as ocean temperatures increase, and effects are expected to be strongest in the southernmost regions (Southern Virginia, Delmarva, and New Jersey), where water temperatures are warmer and

closer to the upper tolerance of the clams. Habitat for surfclams has declined in Delmarva, increased in the New Jersey and Long Island areas, and varied without trend in Southern New England and Georges Bank. These results seem to be related to temperature, and temperature and depth preferences for surfclams seem to be ‘relatively consistent’ over time. Temperature shifts may be affecting biological parameters in surfclams, with declines in average maximum length in Delmarva and NJ and decreases in growth rates off NJ and in Southern New England. Habitats suitable for surfclams vs. quahogs were also compared for the assessment because the fishery performs best in areas of low co-occurrence. Over the period 1982-2011 in Southern New England, co-occurrence decreased almost linearly. This suggests that while there are some changes occurring in Southern New England, there are larger shifts in habitat availability further south. Thus, the impacts of habitat changes in surfclams on the Southern New England fishery are mostly indirect and result more from shifts in effort towards northern areas.

Essential Fish Habitat: EFH for surfclams was designated in 1998 via Amendment 12 to the FMP (MAFMC 1998), described as: throughout the substrate, to a depth of three feet below the water/sediment interface, within federal waters from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic EEZ, in areas that encompass the top 90% of all the ranked ten-minute squares for the area where surfclams were caught in the Northeast Fisheries Science Center surfclam and ocean quahog dredge surveys. Surfclams generally occur from the beach zone to a depth of about 200 feet, but abundance is low below about 125 feet. The EFH map designations include selected waters from Cape Hatteras to Georges Bank, with a slightly smaller footprint associated with the designation for adults versus juveniles.

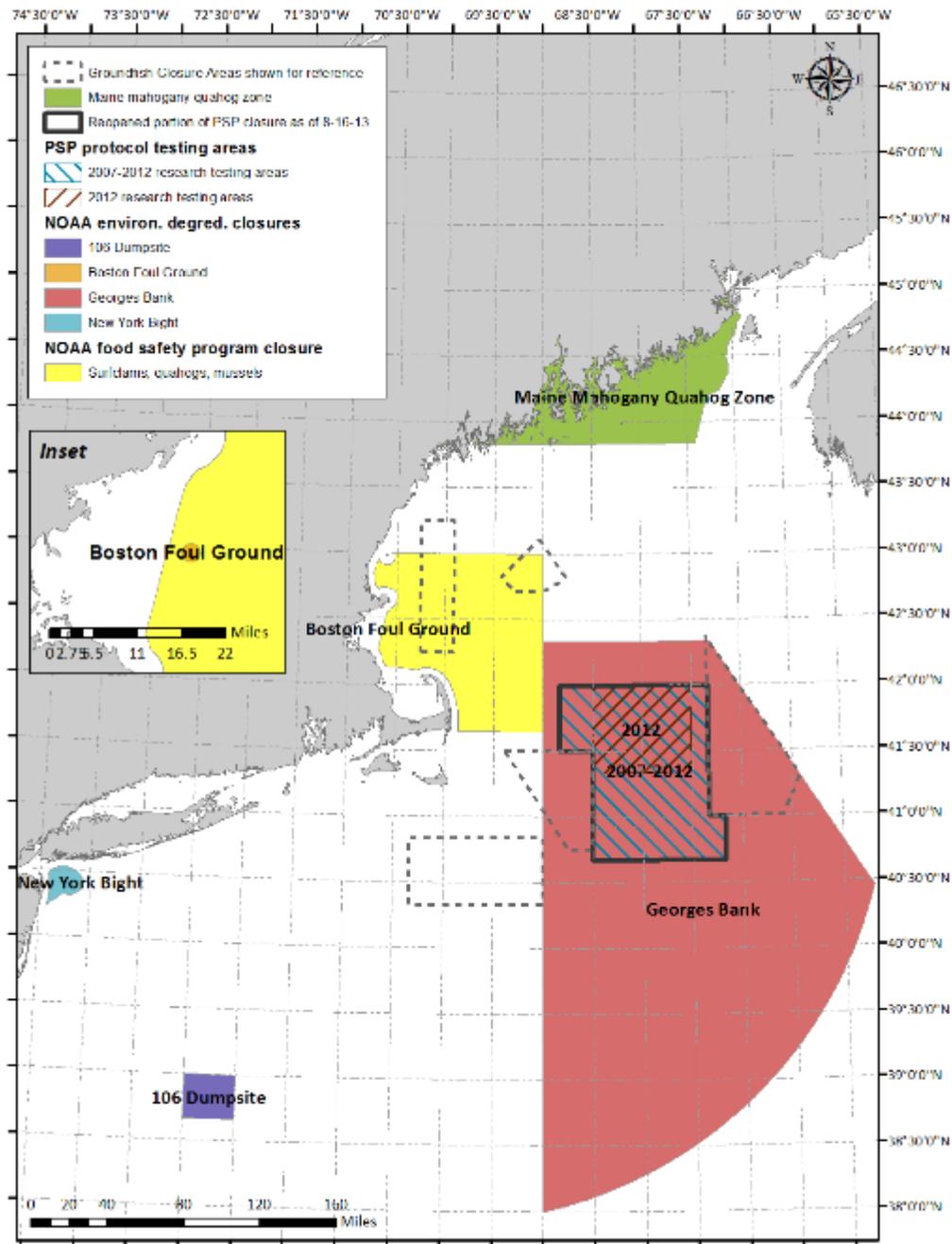
Distribution within the HMA: *To be completed*

Management: The MAFMC developed the Surfclam and Ocean Quahog Fishery Management Plan in the mid-1970s and it was implemented in 1977. The FMP established the management unit as all Atlantic surfclams in the Atlantic Exclusive Economic Zone (EEZ). The FMP is managed by the MAFMC, in conjunction with NMFS as the Federal implementation and enforcement entity. The primary management tool is the specification of an annual quota, which is allocated to the holders of allocation shares (Individual Transferable Quotas - ITQs) at the beginning of each calendar year as specified in Amendment 8 to the FMP (1988). These fisheries were the first in the U.S. to adopt an ITQ system (the Maine mahogany quahog fishery is not managed under ITQs). In addition to the Federal waters fishery, there is a small fishery prosecuted in the state waters of New York, New Jersey, and Massachusetts. Quota shareholders may purchase, sell, or lease quota to and from other shareholders. A framework adjustment in 2007 required the use of VMS for all vessels participating in the surfclam or ocean quahog fisheries. Additional information is available at: <http://www.mafmc.org>.

Waters of the Gulf of Maine and Georges Bank are subject to intermittent harmful algal blooms, or “red tide,” caused by the dinoflagellate *Alexandrium fundyense*, which produces a toxin known to cause paralytic shellfish poisoning (PSP) in people consuming contaminated clams. Because of a history of harmful algal blooms and limited testing in the area, eastern Georges Bank was closed to the harvest of clams starting in 1990. In 2013, a portion of Georges Bank (grey outlined area on Map 3) was opened for the harvest of surfclams and ocean quahog by

vessels using a new PSP testing protocol. This area was accessible to vessels developing the PSP testing protocol during 2007-2012 (hatched areas on Map 3). Other areas in the Gulf of Maine and in Southern New England were closed in 2005 due to an outbreak of *A. fundyense* in these areas (70 FR 35047, the Gulf of Maine or Northern PSP Closure Area is shown in yellow on Map 3). This northern area reopened in 2015 (79 FR 73554, see additional discussion in clam section of Volume 4). A Southern Temporary PSP Closure Area also restricted clam harvesting briefly during summer 2005, but the area was reopened later that year (70 FR 53580).

Map 3 – Management areas relevant to the clam fishery. The current and former year-round groundfish closure areas are shown for reference – vessels dredging for surfclams or ocean quahogs are exempted from the Western Gulf of Maine, Cashes Ledge, and Nantucket Lightship closures.



5.3.2 Blue mussels

Distribution and life history: In our region, two mussel species are commonly found offshore in deeper water, the blue mussel, *Mytilus edulis* and the horse mussel, *Modiolus modiolus*. The

focus in this action is on blue mussels, which are of commercial importance. Blue mussels occur as far south as South Carolina and are common in shallow, nearshore waters. They attach by means of byssal threads to any type of firm substrate and often form shoals or “beds,” even on muddy tidal flats. They also occur on the continental shelf to depths of several hundred feet (Gosner 1978). In prime habitats, blue mussels can reach full growth within a year; elsewhere 2-5 years are needed (Gosner 1978).

The horse mussel is a boreal species that is reported to occur as far south as Cape Hatteras (Coen and Grizzle 2007) but may be scarce south of Cape Cod (Gosner 1978). It mainly inhabits deeper waters (to 70 meters) and most commonly occur partially buried in soft sediments or attached by byssal threads to hard substrates where it forms clumps or extensive beds that vary in size, density, thickness, and form (ASMFC 2007). Horse mussels do not presently appear to occur in great abundance within the HMA (Powell et al 2018). *M. modiolus* is a long-lived species, with some individuals living for 25 years or more (Coen and Grizzle 2007).

While mussels are solitary vs. colonial animals, they do have a contagious distribution. Mussels provide a settlement substrate for other epifauna including hydroids, bryozoans, and sponges.

Expand on their ecological role.

Population status: Unknown

Essential Fish Habitat: None designated, no federal fishery management plan.

Management: Blue mussels are the target of commercial fishing. Fishing for mussels in federal waters is not managed as a stock in a federal fishery management plan. Historically, there had been a mussel fishery on Nantucket Shoals in the 1980s, and was likely the basis for the Nantucket Shoals Mussel and Sea Urchin Dredge Exemption Area (see 50 CFR 648.80(a)(12)) created in 1997 by Framework Adjustment 20 to the Northeast Multispecies Fishery Management Plan . Unless otherwise prohibited in CFR §648.81, §648.370, or §648.371, a vessel may fish with a dredge in the exemption area, provided that any dredge on board the vessel does not exceed 8 ft (2.4 m), measured at the widest point in the bail of the dredge, and the vessel does not fish for, harvest, possess, or land any species of fish other than mussels and sea urchins.

Under OHA2, implemented April 9, 2018, the Great South Channel HMA is closed to all mobile bottom-tending gear. Atlantic surfclam and ocean quahog permitted vessels fishing with hydraulic clam dredge gear are exempt from a portion of this closure until April 9, 2019 (see § 648.370(h)). Mussel dredges are prohibited in the HMA, but the gear can be used in portions of the Nantucket Shoals Mussel and Sea Urchin Dredge Exemption Area that lie outside of the Great South Channel HMA.

A permit is required to land mussels in Massachusetts, and the state collects data on fishing location associated with mussel landings. Since the fishery is not federally managed, mussel dredge vessels are not required to submit a VTR unless they have another federal permit that requires such. There are no recent vessel trip report records from the mussel dredge fishery.

Mussel dredges are not currently being observed at sea under the Standardized Bycatch Reporting Methodology. However, observer requirements could still apply to mussel dredge vessels if they held another federal permit for Atlantic sea scallops, Northeast multispecies, Monkfish, Skates, Atlantic mackerel, Squid, Butterfish, Scup, Black seabass, Bluefish, Spiny dogfish, Atlantic herring, Tilefish, Atlantic deep-sea red crab, Summer flounder (moratorium permit), American lobster, Atlantic surfclam, and/or Ocean quahog.

5.3.3 Other managed resources

The other managed resources described here are those that have Essential Fish Habitat designations that occur within the Great South Channel, and thus may be impacted by the alternatives under consideration.

5.3.3.1 Large mesh multispecies

There are 13 species managed under the Northeast Multispecies Fishery Management Plan (FMP) as large mesh (groundfish) species, based on fish size and type of gear used to harvest the fish: American plaice, Atlantic cod, Atlantic halibut, Atlantic wolffish, haddock, pollock, redfish, ocean pout, yellowtail flounder, white hake, windowpane flounder, winter flounder, and witch flounder. Several large mesh species are managed as two or more stocks based on geographic region. The commercial fishery catches all of these species, but the recreational fishery focuses on GOM cod and GOM haddock (NEFMC 2017). The alternatives under consideration comprise areas of Essential Fish Habitat that are particularly important to Gulf of Maine cod, Georges Bank cod, Gulf of Maine winter flounder, and Georges Bank winter flounder.

Distribution and life history:

Population status: The stock status varies for the four groundfish stocks for which the areas under consideration are Essential Fish Habitat (Table 2) (NEFSC 2017b). For winter flounder, both stocks are *not subject to overfishing*. The Georges Bank stock is *not overfished*, but it is *unknown* whether the Gulf of Maine stock is as well. For cod, both stocks are *overfished*. The Georges Bank stock is *subject to overfishing*, but it is *unknown* whether the Georges Bank stock is as well.

Table 2 – Status of selected Northeast groundfish stocks, FY2017

Stock	2017 Assessments	
	Overfishing?	Overfished?
Georges Bank cod	Unknown	Yes
Gulf of Maine cod	Yes	Yes
Georges Bank winter flounder	No	No
Gulf of Maine winter flounder	No	Unknown

Source: NEFSC (2017b).

Essential Fish Habitat:

Management: Groundfish has been managed since 1977 with the adoption of a groundfish plan for cod, haddock, and yellowtail flounder. This plan first relied on hard quotas, but the quota system ended in 1982 with the adoption of the Interim Groundfish Plan, which controlled fishing mortality with minimum fish sizes and codend mesh regulations. The Northeast Multispecies FMP replaced this plan in 1986, initially continuing to control fishing mortality with gear restrictions and minimum mesh size, and used biological targets based on a percentage of maximum spawning potential. The FMP has had many revisions in subsequent years. Since 2010, most of the fishery has been managed with a catch share program, in which self-selected groups of commercial fishermen (i.e., sectors) are allocated a portion of the available catch.

5.3.3.2 Northeast skate complex

Distribution and life history: There are seven species in the Northeast Region skate complex: little skate (*Leucoraja erinacea*), winter skate (*L. ocellata*), barndoor skate (*Dipturus laevis*), thorny skate (*Amblyraja radiata*), smooth skate (*Malacoraja senta*), clearnose skate (*Raja eglanteria*), and rosette skate (*L. garmani*). Barndoor skate is the most common skate in the Gulf of Maine, on Georges Bank, and in southern New England. Georges Bank and southern New England is the center of distribution for little and winter skates in the Northeast Region. Thorny and smooth skates typically occur in the Gulf of Maine. Clearnose and rosette skates have a more southern distribution and occur primarily in southern New England and the Chesapeake Bight. Skates are not known to undertake large-scale migrations but move seasonally with changing water temperature; they move offshore in summer and early autumn and then return inshore during winter and spring. Skates lay eggs enclosed in a hard, leathery case commonly called a mermaid's purse. Incubation time is 6 - 12 months, with the young having the adult form at the time of hatching. Catches of these species are largely interrelated with the NE multispecies, monkfish, and scallop fisheries (NEFSC 2011).

Population status: Of the seven species within the Northeast skate complex, thorny skate is **overfished**, but overfishing is not occurring. All other skate species are **not overfished and overfishing is not occurring**.

Essential Fish Habitat:

Management: NMFS implemented the Northeast Skate Complex Fishery Management Plan in September 2003. The FMP requires dealers and vessels to report skate landings by species. Framework Adjustment 2 modified the VTR and dealer reporting codes to further improve species specific landing reports. Possession prohibitions of barndoor, thorny, and smooth skates in the Gulf of Maine were also provisions of the FMP. The FMP implemented a trip limit of 10,000 lbs (4,536 kg) for winter skate and required fishermen to obtain a Letter of Authorization to exceed trip limits for the little skate bait fishery. In 2010, Amendment 3 to the Skate FMP implemented a rebuilding plan for smooth skate and established an ACL and annual catch target for the skate complex, total allowable landings for the skate wing and bait fisheries, and seasonal quotas for the bait fishery. Possession limits were reduced, in-season possession limit triggers were implemented, as well as other measures to improve management of the skate fisheries. Skates are harvested in two different fisheries, one for lobster bait and one for wings for food. Fishery specific Total Allowable Landings (TALs) and possession limits are set as part of

specifications. Both fisheries have independent seasonal management structures. Both fisheries are subject to effort controls and accountability measures.

5.3.3.3 *Sea scallops*

Distribution and life history: Sea scallops, *Placopecten magellanicus*, are distributed in the northwest Atlantic Ocean from Newfoundland to North Carolina, mainly on sand and gravel sediments where bottom temperatures remain below 20° C (68° F). North of Cape Cod, concentrations generally occur in shallow water <40 m (22 fathoms) deep. South of Cape Cod and on Georges Bank, sea scallops typically occur at depths 25 - 200 m (14 - 110 fathoms), with commercial concentrations generally 35 - 100 m (19 - 55 fathoms). Sea scallops are filter feeders, feeding primarily on phytoplankton, but also on microzooplankton and detritus (Hart & Chute 2004). Sea scallops grow rapidly during the first several years of life. Between ages 3 and 5, they commonly increase 50 - 80% in shell height and quadruple their meat weight. Sea scallops have been known to live more than 20 years. They usually become sexually mature at age 2, but individuals younger than age 4 probably contribute little to total egg production. Sexes are separate, and fertilization is external. Spawning usually occurs in late summer and early autumn; spring spawning may also occur, especially in the Mid-Atlantic Bight. Sea scallops are highly fecund; a single large female can release hundreds of millions of eggs annually. Larvae remain in the water column for four to seven weeks before settling to the bottom. Sea scallops attain commercial size at about four to five years old, though historically, three-year olds were often exploited. Sea scallops have a somewhat uncommon combination of life-history attributes: low mobility, rapid growth, and low natural mortality (NEFSC 2011).

Population status: The scallop resource was last assessed in 2014, and it was *not overfished, and overfishing was not occurring* (NEFSC 2014).

Essential Fish Habitat:

Management: Sea scallops are managed by the New England Fishery Management Council, which established the Scallop FMP in 1982. The commercial fishery is conducted year-round, primarily using offshore New Bedford style scallop dredges. A small percentage of the fishery employs otter trawls, mostly in the Mid-Atlantic. The principal U.S. commercial fisheries are in the Mid-Atlantic (from Virginia to Long Island, New York) and on Georges Bank and neighboring areas, such as the Great South Channel and Nantucket Shoals. There is also a small, primarily inshore fishery for sea scallops in the Gulf of Maine. The fishery consists of two primary fleets, the Limited Access (LA) fleet, and the Limited Access General Category (LAGC) fleet. The LA fleet is managed with days-at-sea and an area rotational access program. The primary component of the LAGC fleet is vessels with Individual Fishing Quotas (IFQ). These vessels are allocated a yearly IFQ allocation which may be leased or permanently transferred among the IFQ fleet and may be fished throughout the fishing year.

5.3.3.4 *Atlantic herring*

Distribution and life history: The Atlantic herring is widely distributed in continental shelf waters of the Northeast Atlantic, from Labrador to Cape Hatteras. Herring is in every major estuary from the northern Gulf of Maine to the Chesapeake Bay. They are most abundant north

of Cape Cod and become increasingly scarce south of New Jersey (Kelly & Moring 1986). Spawning occurs in the summer and fall, starting earlier along the eastern Maine coast and southwest Nova Scotia (August – September) than in the southwestern GOM (early to mid-October in the Jeffreys Ledge area) and GB (as late as November - December; Reid *et al.* 1999). In general, GOM herring migrate from summer feeding grounds along the Maine coast and on GB to SNE/MA areas during winter, with larger individuals tending to migrate farther distances. Atlantic herring play an important role as forage in the Northeast U.S. shelf ecosystem. They are eaten by a wide variety of fish, marine mammals, birds, and (historically) by humans in the region.

Population status: Presently, herring from the GOM (inshore) and GB (offshore) stock components are combined for assessment purposes into a single coastal stock complex. As of the 2015 operational assessment, Atlantic herring was **not overfished and overfishing was not occurring**. The retrospective adjusted spawning stock biomass in 2014 is estimated to be 622,991 mt, which is 150% of the biomass target (Deroba 2015).

Essential Fish Habitat:

Management: The Atlantic herring fishery is managed by the NEFMC. Due to the spatial structure of the Atlantic herring stock complex (multiple stock components that separate to spawn and mix during other times of the year), the total annual catch limit for Atlantic herring (stock-wide ACL/OY) is divided and assigned as sub-ACLs to four management areas. The best available information is used about the proportion of each spawning component of the Atlantic herring stock complex in each area/season and minimizing the risk of overfishing an individual spawning component to the extent practicable. The fishery uses quotas by area and season. Prosecuted primarily by midwater trawls (single and paired) and purse seines, management measures include bycatch caps for haddock and river herring/shad.

5.3.3.5 American lobster

Distribution and life history: American lobsters (*Homarus americanus*) are benthic crustaceans found in U.S. waters from Maine to New Jersey inshore and Maine to North Carolina offshore. Lobsters tend to be solitary, territorial, and exhibit a relatively small home range of 5-10 km², although large mature lobsters living in offshore areas may migrate inshore seasonally to reproduce, and southern inshore lobsters may move to deeper areas to seek cooler temperatures on a seasonal or permanent basis.

Population status: The 2009 lobster stock assessment assumed three distinct stocks: Gulf of Maine, Georges Bank, and Southern New England. However, the 2015 stock assessment combined the Gulf of Maine and Georges Bank stocks to more effectively model recruitment size compositions and seasonal variations in the location of large females. The 2015 assessment concluded that the SNE stock is **depleted** (record low levels), while the GOM/GB stock **not overfished** (record abundance). However, **overfishing is not occurring** for either stock. However, the overfishing determination for SNE may be misleading and unreliable, because the methods used to estimate fishing mortality are not designed for such low biomass situations (ASMFC 2015).

Essential Fish Habitat: No federal EFH designation, but important habitats identified in FMP.

Management: Lobster is managed by the Atlantic States Marine Fisheries Commission in state waters (0-3 nm from shore) and by NMFS in federal waters (3-200 mi from shore). The fishery occurs within the three stock units: Gulf of Maine, Georges Bank, and Southern New England, each with an inshore and offshore component. The management area is Area 3 (offshore Gulf of Maine, Georges Bank, and Mid-Atlantic Bight to the EEZ). The fishery is managed using minimum and maximum lobster sizes; limits on the number and configuration of traps; possession prohibitions on egg-bearing females and v-notched lobsters, lobster meat, or lobster parts; prohibitions on spearing lobsters; and limits on non-trap landings. Between 1981 and 2013, 96% of all lobster was harvested using traps (ASMFC 2015).

5.4 Human communities

This framework evaluates the effect management alternatives may have on the human environment: the economy, ways of life, traditions, and communities. These social and economic impacts may be driven by changes in fishery flexibility, opportunity, stability, certainty, safety, and/or other factors. While it is possible that social and economic impacts could be solely experienced by individuals, it is more likely that impacts would be experienced across communities, gear types, and/or vessel size classes.

Summarized here are the fisheries and human communities most likely to be impacted by the Alternatives under Consideration. Social, economic and fishery information presented herein is useful in describing the response of the fishery to past management actions and predicting how the alternatives may affect human communities. Additionally, this section establishes a descriptive baseline for the fishery with which to compare actual and predicted future changes that result from management actions.

Consideration of the economic and social impacts on these communities from proposed fishery regulations is required by the National Environmental Policy Act (NEPA 1970) and the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA 2007). Before any agency of the federal government may take “actions significantly affecting the quality of the human environment,” that agency must prepare an Environmental Assessment that includes the integrated use of the social sciences (NEPA §102(2)(C)). National Standard 8 of the MSFCMA stipulates that “conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities” (16 U.S.C. §1851(a)(8)).

A “fishing community” is defined in the MSFCMA, as amended in 1996, as “a community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community” (16 U.S.C. § 1802(17)). Determining which fishing communities are “substantially dependent” on and “substantially engaged” in the surfclam fishery can be difficult. National Standard 8 requires

the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. “Sustained participation” is interpreted as continued access to the fishery within the constraints of the condition of the resource.

Although it is useful to narrow the focus to individual communities in the analysis of fishing dependence, there are several potential issues with the confidential nature of the information. There are privacy concerns with presenting the data in such a way that proprietary information (landings, revenue, etc.) can be attributed to an individual vessel or a small group of vessels. This is particularly difficult when presenting information on ports that may only have a small number of active vessels. MSFCMA §402(b), 16 U.S.C. 1881a(b) states that no information gathered in compliance with the Act can be disclosed, unless aggregated to a level that obfuscates the identity of individual submitters. The fishery data in this action are thus aggregated to at least three reporting units, to preserve confidentiality. Additional standards are applied to reporting the fishing activity of states and fishing communities. To report landings activity to a specific geographic location, the landings have been attributed to at least three fishing permit numbers and the landings must be sold to three dealer numbers. However, the dealers do not necessarily have to be in the same specific geographic location.

For additional information on the fishing communities described in this section, refer to:

- ***Snapshots of Human Communities and Fisheries in the Northeast*** are brief summaries with the most recent data for key indicators of dependence on fisheries and other economic and demographic characteristics:
<http://www.nefsc.noaa.gov/read/socialsci/communitySnapshots.php>.
- ***Community Profiles for the Northeast U.S. Fisheries*** are in-depth information on the historic, demographic, cultural, and economic context for understanding a community's involvement in fishing (Clay *et al.* 2007, also at snapshots link).

5.4.1 Method to identify *Communities of Interest*

There are several fisheries potentially impacted by this action that are active in fishing communities throughout the Greater Atlantic Region. The approach to identifying the *Communities of Interest* here is, where possible, consistent with how the lead management entity for each fishery (e.g., NEFMC, MAFMC, ASMFC) has identified important communities. In cases where the lead management entity has not previously identified important communities, a method developed through a prior NEFMC action was used or a method was developed here. For each fishery described, the specific method used to identify its *Communities of Interest* is included at the beginning of each subsection of §5.4.2.11.

Several of the specific methods include use of the ***NMFS Community Vulnerability Indicators***, which provide a broader view of the degree of involvement of communities in fisheries than simply using pounds or revenue of landed fish. The indicators portray the importance or level of dependence of commercial or recreational fishing to coastal communities.

- ***The engagement index*** incorporates the pounds and value of landed fish, the number of commercial fishing permits with that community as the permit holder's homeport, and the number of dealers buying fish in that community (all using dealer data).
- ***The reliance index*** is a per capita measure using data for the engagement index divided by the total population of the community.

Using a principal component and single solution factor analysis, each community receives a factor score. A score of 1.0 or more places the community at 1 standard deviation above the mean (or average) and is considered highly engaged or reliant. Communities with scores below 0.0 have low engagement/reliance (Jepson & Colburn 2013). These indicators have been developed community-wide for commercial and recreational fishing for over 3,800 communities nationally (<http://www.st.nmfs.noaa.gov/humandimensions/social-indicators/index>). There is ongoing work to develop fishery-specific indicators. Where available, the specific indicators are included in this action.

5.4.2 Surfclam fishery

5.4.2.1 Overview

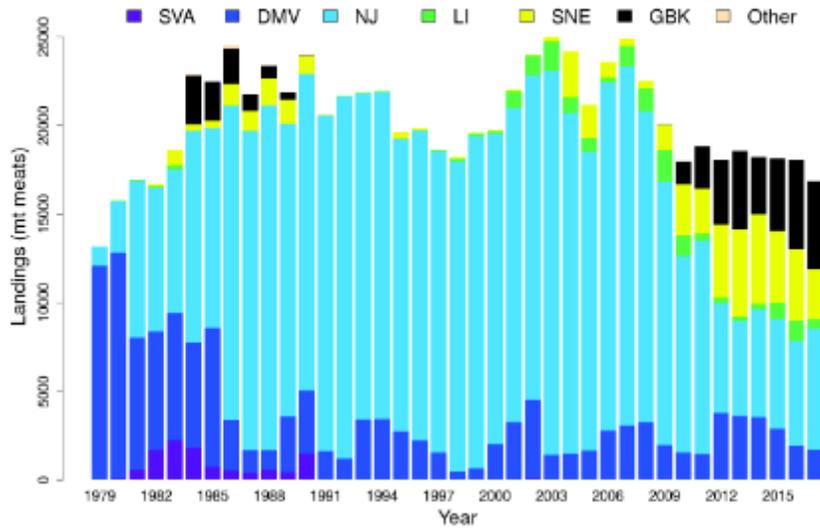
The surfclam industry began around 1870 as a bait fishery for the groundfish fleet, although surfclams had been harvested for subsistence, livestock feed and fertilizer for at least 250 years prior. Demand for food during World War II led to the increased harvests and use of clam meat for human consumption. Harvests were concentrated off the New York coast until the discovery of extensive clam beds off New Jersey around 1950. Waters near Delaware and Maryland were also important during this time. In the early 1970s, diminished surfclam beds off New Jersey led to shifting effort to waters off Virginia (Ritchie 1977). Since 2010, landings from Southern New England and Georges Bank have increased. Almost all landings of surfclams are from vessels using hydraulic clam dredges. The relatively small Maine mahogany quahog fishery uses a non-hydraulic dredge. In addition to the Federal waters fishery, there is a small surfclam fishery prosecuted in the state waters of New York, New Jersey, and Massachusetts. There is no recreational fishery for the species.

5.4.2.2 Current specifications and catch

Since Annual Catch Limits (ACLs) were first specified for Atlantic surfclams in 2010, ACLs have declined from 97K mt in 2010-2013 to 29K mt in 2018-2020 (Table 3). However, both the quota available to the federal fishery, 26K mt or 3.4M bushels, and quota utilization has remained constant since 2010 and at about 70% of the available quota. Industry has indicated that this is their preferred level due to economic factors (e.g., market and processor demand, quota lease prices, financial equity; MAFMC 2017) (Table 3).

The surfclam fishery primarily occurs in waters off New York to Maryland, southeast of Cape Cod on Nantucket Shoals, and on Georges Bank. The distribution of catches has changed over time, with a shift to increased landings in Southern New England and Georges Bank Areas (Figure 4, Map 4). The Great South Channel Habitat Management Area, the focus of this framework, occurs within the Southern New England Area. Thus, this action is focusing on a region that has become increasingly important for the fishery.

Figure 4 - Surfclam landings from the U.S. EEZ during 1979-2016, and preliminary 2017



Source: Dan Hennen Pers. Comm., NEFSC 2018, as cited in MAFMC (2018a).

Table 3 – Federal surfclam quotas and landings, 1998-2020

Year	OFL (mt)	ABC/ACL (mt)	Total Landings (mt meats; incl. state waters)	EEZ Landings (mt meats)	EEZ Landings ^a ('000 bu)	EEZ Quota ('000 bu)	% Harvested
1998	NA	NA	24,506	18,234	2,365	2,565	92%
1999	NA	NA	26,677	19,577	2,539	2,565	99%
2000	NA	NA	31,093	19,788	2,566	2,565	100%
2001	NA	NA	31,237	22,017	2,855	2,850	100%
2002	NA	NA	32,645	24,006	3,113	3,135	99%
2003	NA	NA	31,526	24,994	3,241	3,250	100%
2004	NA	NA	26,463	24,197	3,138	3,400	92%
2005	NA	NA	22,734	21,163	2,744	3,400	81%
2006	NA	NA	25,779	23,573	3,057	3,400	90%
2007	NA	NA	27,091	24,915	3,231	3,400	95%
2008	NA	NA	25,223	22,510	2,919	3,400	86%
2009	NA	NA	22,396	20,065	2,602	3,400	77%
2010	129,300	96,600	19,941	17,984	2,332	3,400	69%
2011	114,000	96,600	20,044	18,839	2,443	3,400	72%
2012	102,300	96,600	18,393	18,054	2,341	3,400	69%
2013	93,400	96,600	18,924	18,551	2,406	3,400	71%
2014	81,150	60,313	18,834	18,227	2,364	3,400	70%
2015	75,178	51,804	18,517	18,154	2,354	3,400	69%
2016	71,512	48,197	18,202	18,039	2,339	3,400	69%
2017	69,925	44,469	17,696 ^c	16,853 ^c	2,186 ^c	3,400	64% ^c
2018 ^b	Not specified	29,363	NA	NA	NA	3,400	NA
2019	Not specified	29,363	NA	NA	NA	3,400	NA
2020	Not specified	29,363	NA	NA	NA	3,400	NA

Notes: Landings for state waters are approximated as total landings - EEZ landings and may not accurately reflect state landings. SSC determined OFLs and ABCs included for years specified.

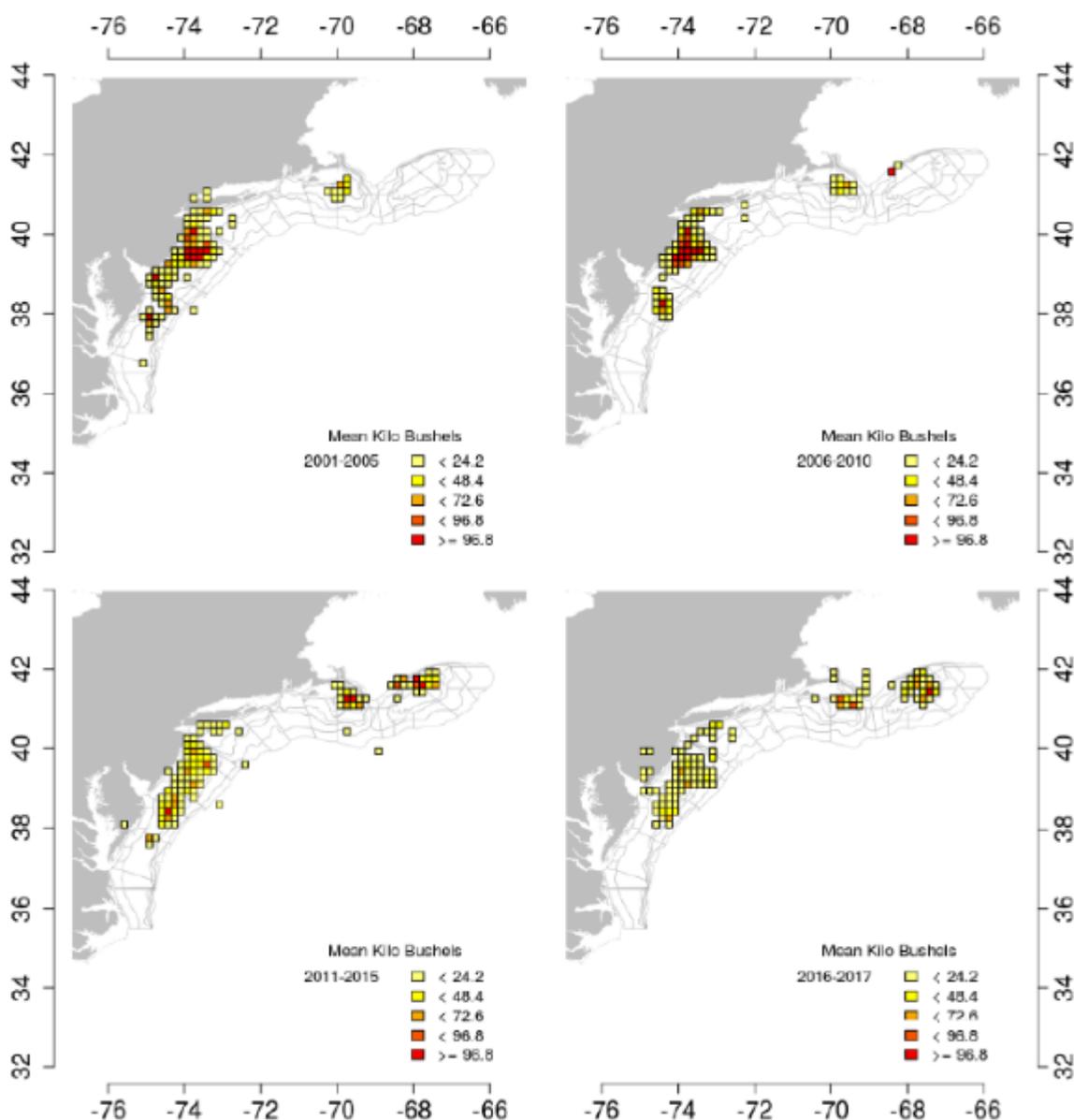
^a 1 surfclam bushel is approximately 17 lb.

^b Revised previous 2018 values due to receipt of a new stock assessment.

^c Preliminary, incomplete 2017 data.

Source: NMFS clam vessel logbook reports. Dan Hennen Pers. Comm., NEFSC 2018.

Map 4 - Average surfclam landings by ten-minute squares over time, 2001-2016, and preliminary 2017



Note: Only squares where more the 5 kilo bushels were caught are shown.

Source: Dan Hennen Pers. Comm., NEFSC 2018, as cited in MAFMC (2018a)

5.4.2.3 Spatial management

Paralytic Shellfish Poisoning Closures. Fishing areas can also be closed for public health related issues due to environmental degradation or the toxins that cause paralytic shellfish poisoning (PSP). PSP is a public health concern, caused by saxitoxins, produced by the alga *Alexandrium fundyense* (red tide). Surfclams on Georges Bank were not fished from 1990 - 2008

due to the risk of PSP. There was light fishing on Georges Bank in years 2009-2011 under an exempted fishing permit and LPUE in that area was substantially higher (5-7 times higher) than in other traditional fishing grounds. Beginning January 1, 2013, a portion of Georges Bank has been open to the harvest of surfclams (77 FR 75057, December 19, 2012, under its authority in 50 CFR 648.76). Harvesting vessels must adhere to the adopted testing protocol from the National Shellfish Sanitation Program (MAFMC 2018a). The industry has invested heavily in PSC protocols and testing (§5.4.2.10).

Other spatial management: There are currently no regulatory area closures for the surfclam fishery, other than for public health issues or in areas encompassing unexploded ordinances. Areas can be closed to surfclam fishing if the abundance of small clams in an area meets certain threshold criteria. During the 1980s, there were three such area closures (off Atlantic City, NJ; Ocean City, MD; and Chincoteague, VA), with the last of the three areas reopening in 1991.

5.4.2.4 Permits and vessels

The Federal surfclam fishery occurs with open access, individual fishing quota (IFQ) or individual transferable quota (ITQ) permits. To fish, permits must have quota allocation, or the permit holder must obtain allocation through quota transfer. In 2017, 617 vessels were issued a Federal surfclam permit, down from 847 in 2008 (Table 4) (GARFO 2018). While the surfclam and ocean quahog fishery is open access, only about 4-6% of permitted vessels have been active recently (32-42 vessels annually; Table 5). Inactive participants likely do not hold quota, likely do not have established marketing relationships with surfclam and ocean quahog processors, and likely do not own gear needed to harvest surfclam and ocean quahog. Some of the active participants may not hold allocation but lease it from others. Some vessels may be part of the same firm, having the same owners. In 2016, there were 349 fishing firms that held at least one surfclam or ocean quahog permit and 24 firms were active (MAFMC 2017). Over time, participants have merged harvesting operations and/or have leased quota, reducing the number of active vessels (Brandt 2005; Olson 2011).

Upon implementation of the ITQ system, the fleet shifted towards use of larger vessels (McCay & Creed 1990). Of the 40 active surfclam vessels in 2017, they ranged in length from 55-139', with 5% (n=2) under 60' long, 63% (n=25) were 60 to 90', and 33% were over 90' (n=13; GARFO 2018) (Table 6). Within the industry, 80-90' vessels are considered medium-sized and do not have the capacity to fish far offshore on Georges Bank or have sufficient revenue to afford PSP testing (§5.4.2.3) to do so. Within New England, vessels of this size have been dependent on the Nantucket Shoals area, some for several decades (personal communications with industry, 2018). For the directed fishery, surfclams and ocean quahogs are harvested with hydraulic dredges, which use water pressure to force the clam out of the sand.

Table 4 - Vessels issued Federal surfclam and ocean quahog permits, 2008-2017

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Has a Federal ocean quahog permit	873	838	781	730	701	674	663	656	658	629
Has a Federal surfclam permit	847	811	753	706	679	654	648	643	647	617
Has both a Federal ocean quahog and surfclam permit	799	776	720	677	651	627	619	621	623	595
Source: GARFO (2018).										

Table 5 – Active vessels in the Federal surfclam fishery, 2008-2017

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Harvesting BOTH surfclams & ocean quahogs	8	8	12	12	13	7	7	6	8	14
Harvesting only surfclams	24	28	22	24	29	33	31	31	30	26
Total active surfclam vessels	32	36	34	36	42	40	38	37	38	40
Source: vessel activity from NMFS clam vessel logbooks; from MAFMC (2018a).										

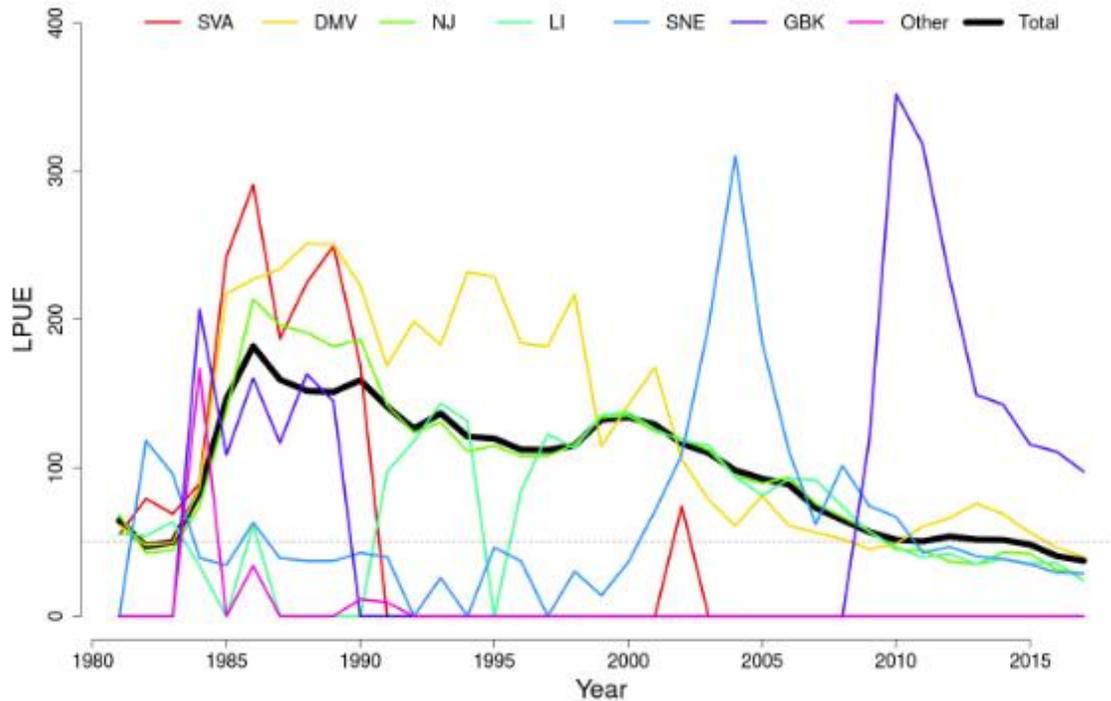
Table 6 – Vessels in the Federal surfclam fishery, 2017

Vessel Length	# vessels	
	All	Active
< 60'	169 (27%)	2 (5%)
60-80'	229 (37%)	19 (48%)
> 80'	219 (35%)	19 (48%)
Total	617 (100%)	40 (100%)
Range	9-158'	55-139'
Source: GARFO (2018).		

5.4.2.5 Fishery effort

Trips: Trips harvesting surfclams have increased in length as catch rates have declined (Figure 5).

Figure 5 - Nominal landings per unit effort (LPUE in bushels landed per hour fished) for surfclam, by region, during 1981-2016, and preliminary 2017



Notes: LPUE is total landings in bushels divided by total fishing effort.

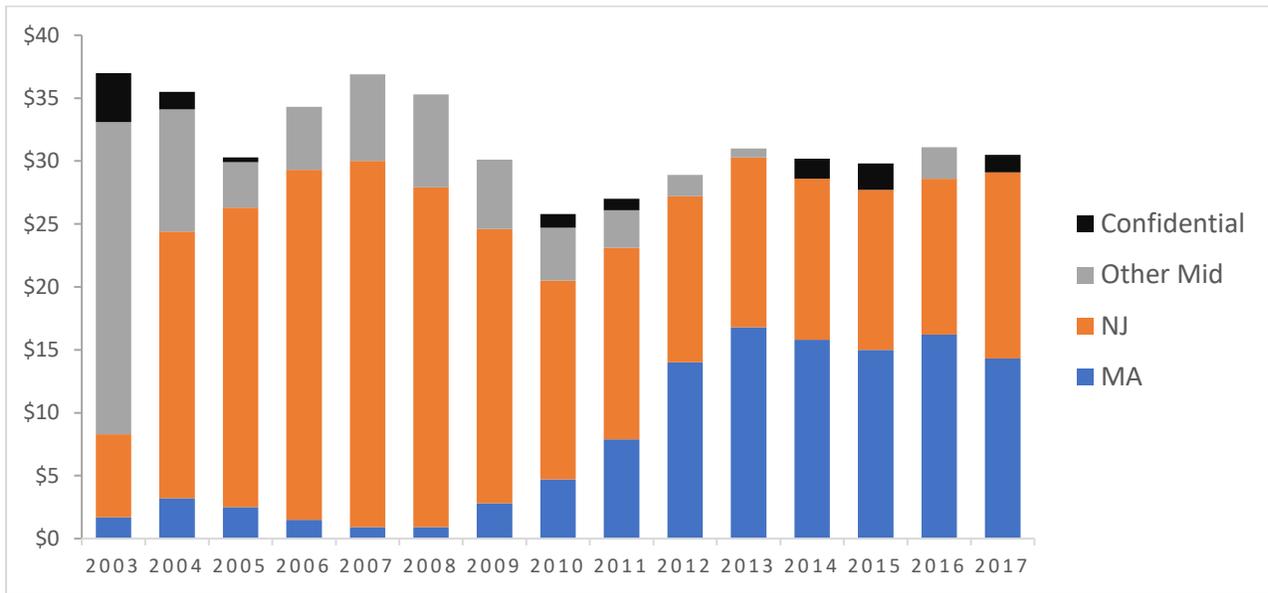
Source: Dan Hennen Pers. Comm., NEFSC 2018, as cited in MAFMC (2018a).

5.4.2.6 Fishery economics

Price of surfclams. The average ex-vessel price of surfclams reported by processors was \$13.90 per bushel in 2017, higher than the prices in 2016 and 2015, \$13.25 and \$12.61 per bushel respectively. Ex-vessel prices for surfclams can vary considerably depending on the meat quality and yield. Surfclam beds in New York State waters and off the Delmarva Peninsula tend to have lower meat weights and command lower prices. Prices also depend on individual contracts with processors. Increasingly, the harvesting and processing sectors are becoming more vertically integrated (MAFMC 2003, p. 97).

Fishery revenue. Ex-vessel revenue from the Federal surfclam harvest has fluctuated between \$26-37M since 2003 (nominal value), hovering at about \$30M since 2012 (Figure 6). Fishery revenue was primarily from landings in New Jersey and other Mid-Atlantic states from 2003 until 2011; since that time, landings in Mid-Atlantic states have declined and landings in Massachusetts have increased and become equivalent to Mid-Atlantic landings. Within New Jersey, landings revenue has largely been from Atlantic City; landings have also occurred in Point Pleasant, but have been minimal since 2013 (Figure 7). Within Massachusetts, landings revenue has largely been from Bristol County (e.g., New Bedford, Fairhaven), though landings have also occurred in Barnstable County (e.g., Hyannis) since at least 2012 (Figure 8).

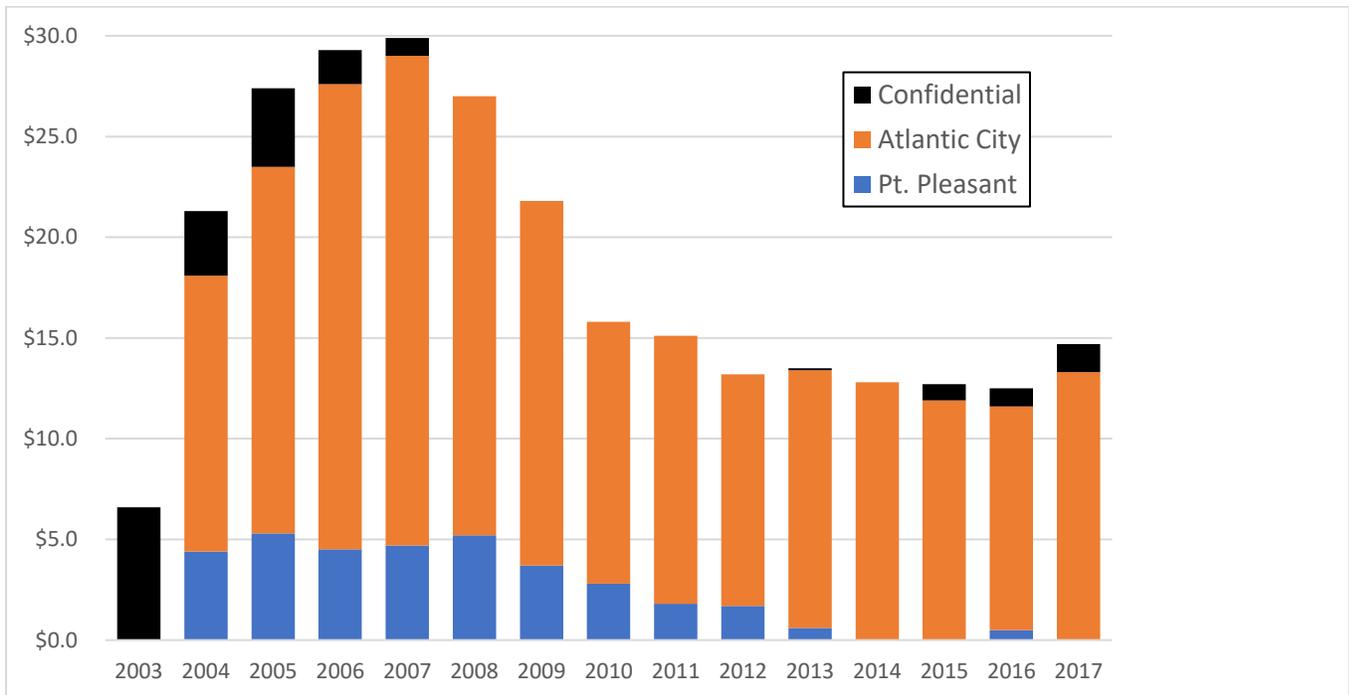
Figure 6 - Atlantic surfclam nominal revenue (\$M) by state, 2003-2017



Note: "Other Mid" includes New York, Delaware, Maryland, Pennsylvania, and Virginia.

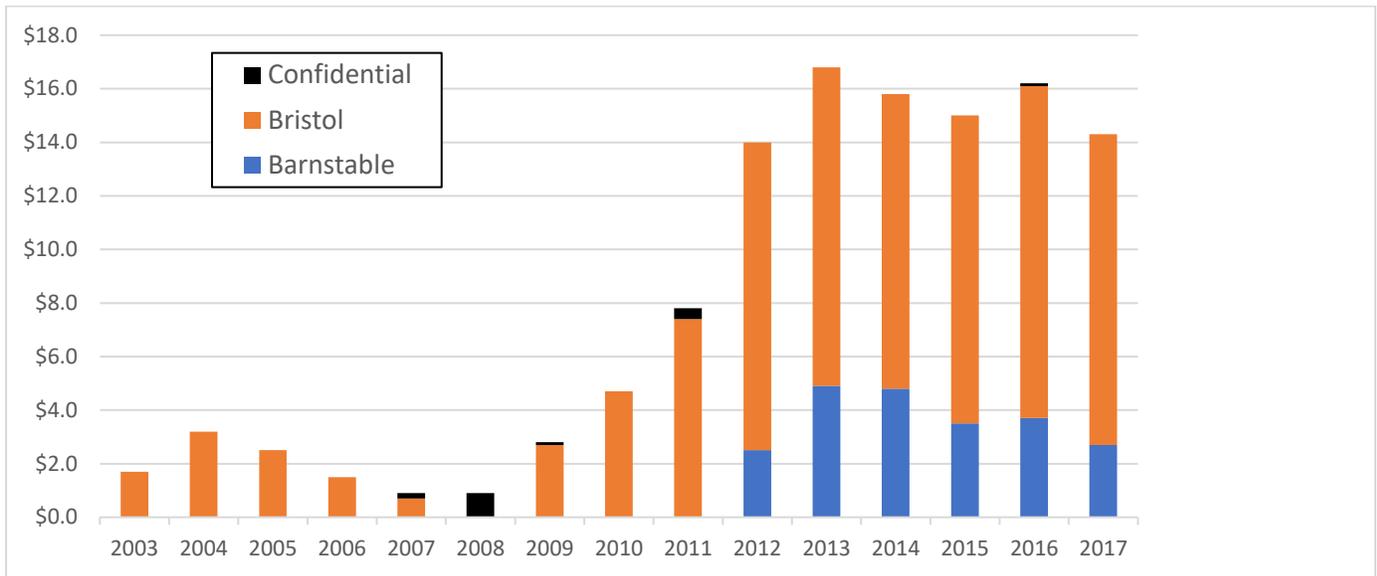
Source: SCOQ processor reports.

Figure 7 – New Jersey landings nominal revenue (\$M) of Atlantic surfclam by landing port, 2003-2017



Source: SCOQ processor reports.

Figure 8 – Massachusetts landings nominal revenue (\$M) of Atlantic surfclam by county, 2003-2017



Source: SCOQ processor reports.

Factors influencing economics. Industry has described several factors that have affected their industry. Major users of clam meats have reduced their purchases from industry and stopped advertising products like clam chowder in the media. Industry members reported that imported meat from Canada and Vietnam has placed downward pressure on clam meat price in the marketplace. The costs to vessels harvesting clams has increased due to the rising costs of insurance; industry has also indicated price of diesel fuel in conjunction with distance traveled to fish is a big factor determining trip cost (MAFMC 2017; 2018a). Within a quota managed fishery such as the surf clam fishery, a regime of decreasing output prices and increasing input costs would be expected to decrease the total effort/landings observed. This interpretation is consistent with the decrease in landings, as detailed in Table 3.

Under fisheries in which quota may be traded, individuals have the flexibility to harvest their annual share of the quota themselves, or to "lease" a portion or all their allocation to others.

5.4.2.7 Dependence on surfclams

The active surfclam and ocean quahog fishery participants derive a large share of gross receipts from the surfclam and ocean quahog fishery (MAFMC 2017).

5.4.2.8 State waters fishery in Massachusetts

In Massachusetts state waters, dredging for surfclams is prohibited during the following seasons and in the following areas with hydraulic and toothed dredges.

- a) November 1-April 30, shoreward of the 12 ft depth contour from Hull to the MA/RI border, including Cape Cod and the Islands
- b) May 1-October 31, shoreward of the 20 ft depth contour, area as defined in a)

- c) Shoreward of a line drawn from Long Point, Provincetown, to the “Hopper” in North Truro
- d) Shoreward of a line drawn from Jeremy Point, Wellfleet, to the “Spire” in Brewster
- e) Shoreward of Seal Rocks off Scraggy Neck, Bourne, to the southernmost tip of Sandy Point Dike, Wareham
- f) May 1-October 31 within an area one mile seaward of mean low water from Great Point Light to Sankaty Light, Nantucket

There are provisions for the administrative requirements for setting additional closures, for openings/closures need for shellfish sanitation purposes, and various specific exemptions to the above list.

Vessels cannot use a hydraulic dredge greater than 48 in. wide or use more than one dredge. There are specific requirements off Chatham. The surfclams harvested must be at least 5 in. long, with clams smaller than this accounting for no more than 5% of the catch, although federal permit holders fishing in federal waters are exempt, as are aquaculture-reared clams. The trip limit is 200 bushels of surfclams per 24-hr day, up to 400 bushels per trip. Again, federally permitted vessels are exempt from this limit, but cannot fish in state waters during the trip if they exceed these limits. Vessels using hydraulic dredges cannot possess or land bay scallops (*Argopecten irradians*) or quahogs (*Mercenaria mercenaria*).

5.4.2.9 Use of surfclams

Traditionally, the dominant use of surfclams has been in the "strip market" to produce fried clams. In the last few decades, they have been used in chopped or ground form for other products, such as high-quality soups and chowders (MAFMC 2003, p. 97; and recent personal communications with industry). The Nantucket Shoals fishery largely supplies the tongue market. It is a high-value market, not replicated elsewhere.

5.4.2.10 Surfclam dealers, processors, and shoreside support

Although this document focuses on the surfclam fishery, the information in this section on the processing sector is for both surfclams and ocean quahogs as some of these facilities purchase/process both species. These fisheries have always been strongly connected to processing facilities, ties which have strengthened over time with fishery consolidation. As of the mid-2000s, processors have direct or indirect control over the majority of fishing quota (McCay 2004). In 2017, there were nine companies reporting purchases of surfclams and/or ocean quahogs from the industrial fisheries outside of Maine, seven of which are located in Massachusetts. In 2017, these companies bought \$31M worth of surfclam and \$23M worth of ocean quahogs (MAFMC 2018a).

The dealers/processors summarized here provide a snapshot of typical business involved in dealing and/or processing surfclams. This information has been volunteered by the businesses and has not been verified through any independent sources of information.

Atlantic Capes Fisheries, Inc. (Fall River, MA; Bristol, RI; and Cape May, NJ). Atlantic Capes Fisheries, Inc., based in Cape May, NJ, is fully-integrated, from harvesting and processing through marketing and distribution. It participates in several fisheries including scallops,

surfclams, groundfish, and squid. Its surfclam vessels, eight in all, fish year-round, primarily on Nantucket Shoals and land in Fairhaven and Hyannis, MA. Product is then trucked to a processing facility in Bristol, RI. It is a hand-shucking operation, in which the clam foot, a tender piece of meat called the “tongue,” is cut down into strips and sold throughout New England to clam shacks, restaurants and home consumers. The “salvage” – the chopped abductor mussel, mantel, syphon, and strap, is sold to clam chowder manufacturers like Blount Soups in Warren, RI, and Kettle Cuisine in Lynn, MA. Atlantic Capes distributes a minor amount of surfclams to New York, but most of the product stays within New England. Atlantic Capes employs over 500 people, including seasonal workers, with about 200 directly involved in its surfclam operations. There are about 80 people in harvesting and hauling (four-man crews on eight vessels, dockside workers, truckers) and about 120 in the processing facility.

Over the 40-year history of the company, it has always participated in the surfclam fishery. Originally, surfclam harvesting and processing (also hand-shucking) were based in Pt. Pleasant, NJ. About ten years ago, the company migrated its surfclam operations to New England due to climate change and the pursuit of a surfclam resource that was diminishing down south. Additionally, surfclam processing facilities need to be near landing docks to preserve meat quality. The Bristol facility has been processing surfclams for almost four decades. It has changed hands more than once, but Atlantic Capes was able to maintain the workforce when it took over. Many employees have processed surfclams there for 35 years and are just shy of retirement age. Atlantic Capes aims to remain competitive in the protein market and has worked to retain good labor by increasing salaries. It is one of the companies approved to participate in using the fishery’s Marine Stewardship Council certification that became effective in December 2016 (<http://www.atlanticcapes.com/>; C. Shriver and P. Hughes, personal communication, 2018).

Nantucket Sound Seafood, LLC. (New Bedford, MA). Nantucket Sound Seafood, LLC., based in New Bedford, MA, is fully-integrated, from harvesting and processing through marketing and distribution. It participates in several fisheries including hardshell quahogs, conch, softshell clams, and bay scallops, but 90% of its revenue comes from surfclams. The owner has been a fisherman for over 30 years, first as a deck hand, then running a vessel, then co-owning a vessel, eventually owning two vessels. He had been selling surfclams to other processors, but needed more independence, so started Nantucket Sound Seafood about five years ago. The company owns *F/V Seafox* and *F/V Miss Kara*, which fish year-round on Nantucket Shoals but in winter also fish in state waters. The vessels land in Hyannis, MA. Nantucket Sound Seafood processes 60,000-80,000 bushels of surfclams annually, primarily harvested by its two vessels, but occasionally buying from other vessels. Like Atlantic Capes, it is a hand-shucking operation, in which the clam foot is cut into strips and the salvage is sold for chowder. Both the fishing and the demand for surfclams occur year-round, though more so in summer. Clams have a longer shelf-life in the winter, so the winter fishery focuses on live clams for markets in Boston and New York. There is year-round demand for chopped meat and strips, and summer fishery caters to tourist markets within Massachusetts (e.g., clam shacks). Additionally, quahog shells are sold to stuffed clam manufacturers.

Nantucket Sound Seafood employs about 45 people year-round, with about 35 in the processing facility and trucking and eight in harvesting (four-man crews on two vessels). The vessels participate in surf clam and ocean quahog surveys for the State of Massachusetts, working closely with Division of Marine Fisheries Assistant Director for shellfish Michael Hickey. The

owner has served on the Massachusetts Shellfish Advisory Board for the past five years. (<https://www.nantucketsoundseafood.com/>; A. Rencurrel, personal communication, 2018).

5.4.2.11 Surfclam fishing communities

Since 2008, there are over 20 communities that have been a homeport or landing port to one or more vessels participating in the surfclam fishery. These ports occur in Massachusetts and throughout the Mid-Atlantic. The level of activity in the surfclam fishery has varied across time. This section seeks to identify the communities for which the Atlantic surfclam is particularly important. Although describing a community's dependence on the fishery, it is important to remember that at least some of the individual vessels therein are even more dependent on Atlantic surfclams.

The surfclam fishing communities likely to be most impacted by this action are those in which landings have been derived from the Great South Channel in recent years. However, area closures have the potential to either preclude fishing or shift effort to areas that remain open, either by shifting the areas that currently active vessels fish or by shifting effort to other vessels that can access areas that remain open. In either case, the landing ports potentially impacted are likely broader than those important to the vessels fishing in the GSC in the past. Thus, it is appropriate to identify here the fishing communities that are important to the entire surfclam fishery.

Community of Interest Criteria. The surfclam fishery *Communities of Interest* (i.e., primary ports) meet at least one of the following criteria:

1. Identified by the MAFMC SCOQ Advisory Panel as important for the fishery (MAFMC 2018b).
2. Revenue in 2012 derived from the Great South Channel, as identified through the Omnibus Habitat Amendment 2 (Volume 4, Table 73).
3. A ranking of “medium-high” or “high” for engagement in or reliance on the surfclam fishery (defined in §5.4.1), according to the NMFS Community Vulnerability Indicators averaged over the five-year period of 2012-2016. This is a subset of the 15 communities that have a surfclam fishery engagement index in the range of low to high (Table 7).

Secondary ports are those that have a “low” or “medium-low” surfclam fishery engagement or reliance index averaged over 2012-2016 that do not meet the criteria for being a primary port. Primary and secondary ports are listed in Table 8.

Table 7 – Surfclam fishing community engagement index for individual years 1990-2010 and engagement and reliance indices for 2012-2016 average

State	Community	1990	1995	2000	2005	2010	2012-2016 Average	
							Engage.	Reliance
ME	Jonesport	-	-	-	-	-	L	M
NH	Portsmouth	-	-	-	-	-	L	L
MA	Gloucester	-	-	-	-	-	L	L
	Hingham	-	-	-	-	-	L	L
	Provincetown	-	-	-	-	-	L	M-H
	Harwichport	-	-	-	-	-	L	H
	Barnstable/Hyannis/Hyannisport	L	L	L	L	L	H	M
	Fairhaven	-	-	-	-	-	H	H
	New Bedford	M-H	H	H	H	H	H	H
RI	Warren	H	H	M-H	L	M	-	-
	Bristol	M	H	H	L	L	-	-
NY	Islip	-	-	-	-	-	L	L
NJ	Point Pleasant	L	L	H	H	H	M-H	M-H
	Atlantic City	L	L	L	H	H	H	H
	Middle/Burleigh	H	L	L	L	L	-	-
	Wildwood	L	L	L	M	L	L	M
	Cape May	H	H	H	L	L	L	H
	Point Norris, Bivalve	H	M	H	L	L	-	-
DE	Milford	L	L	L	L	L	-	-
MD	Ocean City	L	H	L	M-H	M-H	M-H	H
VA	Accomack/Atlantic/Mappsville/Sanford	L	L	L	L	L	-	-
	Northampton/Willis Wharf	H	M-H	L	L	L	-	-
	Northampton/ Oyster	H	L	L	L	L	-	-
	Norfolk	H	H	H	L	L	-	-

Source: Colburn *et al.* (2017).

Index scores: "L" = low (<0.0); "M" = medium (0.0-0.49); "M-H" = medium-high (0.5-0.99); "H" = high (≥ 1)

Fishing Communities of Interest. There are nine communities that meet one or more of the above criteria for being a community of interest/primary port in the surfclam fishery; six communities are secondary ports (Table 8). Ports in New Jersey and Massachusetts handle the most volume and value. Since 1990, there has been a northward shift in the ports engaged in the surfclam fishery, as seen in Table 7, though Ocean City, MD and Atlantic City and Point Pleasant, NJ remain important ports. Within Massachusetts, New Bedford and

Barnstable/Hyannis/Hyannisport have been engaged in the fishery since at least 1990 (New Bedford to a higher degree). In recent years, Fairhaven has been highly engaged and six ports north of Barnstable have become engaged in the fishery, but at a low level, including ports in New Hampshire and Maine. Should the northward trend continue, these ports may become more important in the future.

Table 8 – Communities of Interest/primary ports and secondary ports in the surfclam fishery

State	Community	AP input	GSC revenue in 2012	Med-high or high engagement or reliance	Primary ports	Secondary ports
ME	Jonesport					√
NH	Portsmouth					√
MA	Gloucester					√
	Hingham					√
	Provincetown			√	√	
	Harwichport			√	√	
	Hyannis/Hyannisport/Barnstable	√	√	√	√	
	New Bedford	√	√	√	√	
	Fairhaven		√	√	√	
NY	Oceanside	√			√	
	Islip					√
NJ	Point Pleasant	√		√	√	
	Atlantic City	√		√	√	
	Wildwood					√
	Cape May			√	√	
MD	Ocean City			√	√	
AP input = most of the vessels are fishing out of these ports today (MAFMC 2018b).						
GSC revenue = 2012 (non-confidential) revenue as identified in OHA2 (Volume 4, Table 73).						

5.4.3 Mussel fishery

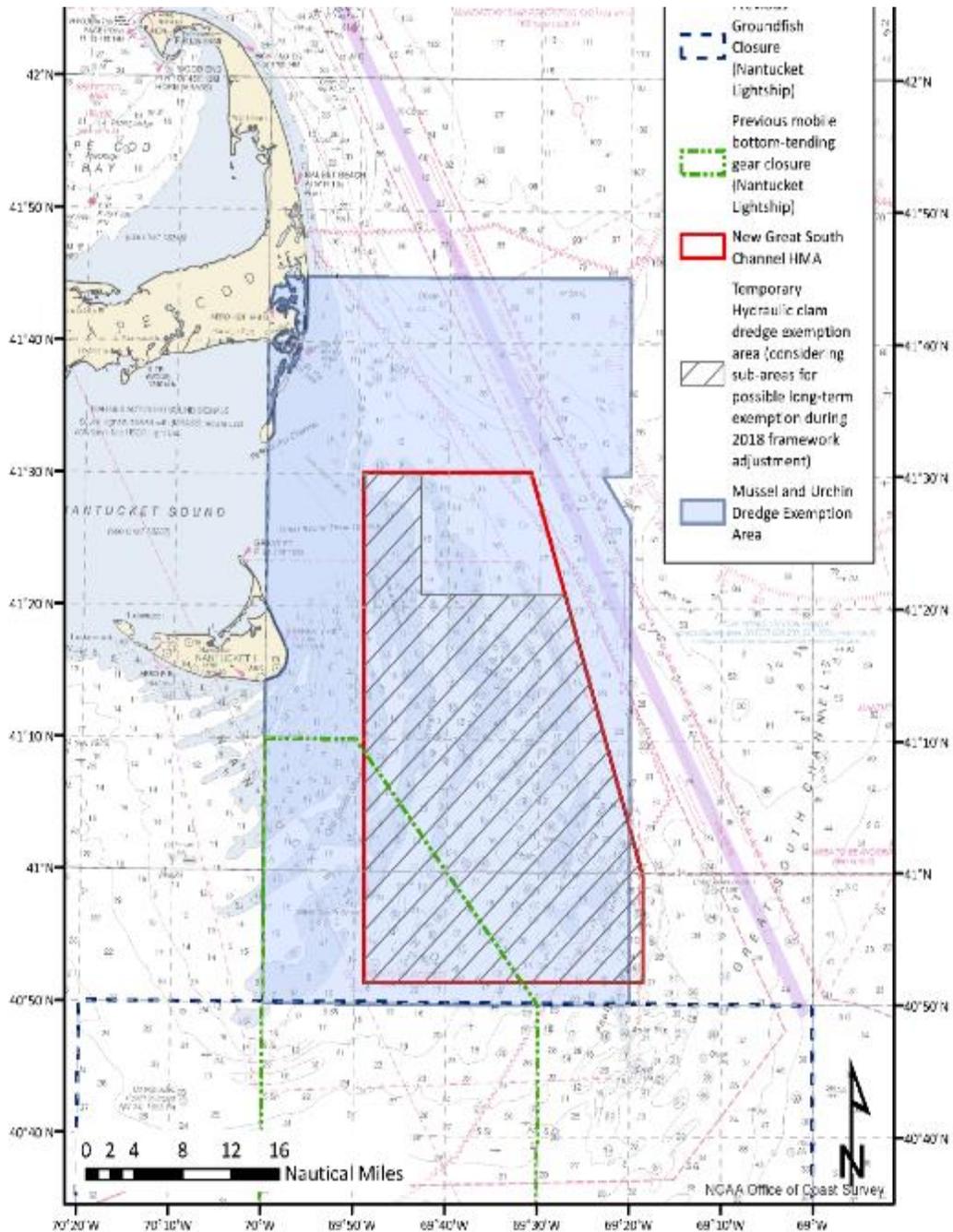
As noted in §5.3.2, mussels can be targeted within the Nantucket Shoals Mussel and Sea Urchin Dredge Exemption Area (Map 5, CFR §648.80). The Nantucket Shoals mussel fishery was active in the 1980s but waned during the 1990s due to storm-related effects on the beds and a large volume of imports (American Mussel Harvesters, Inc. and Chatham Light Seafood, personal communication, 2018). The lack of data for this fishery makes it difficult to say precisely when it ended or how large the fishery had been. During the development of OHA2, it was not anticipated that this lapsed fishery would reemerge, however, during the development of this framework, the industry indicated that there is renewed interest in mussel harvest on Nantucket Shoals. At present, mussel dredging in the GSC HMA is prohibited as of April 9, 2018, because mussel dredges are considered a mobile bottom-tending gear.

Fishery overview. The mussel dredge fishery is growing in Massachusetts, with ex-vessel landings valued at \$5.9 million, \$10.3 million, and \$11.6 million harvested from state waters for fishing years 2013-2015 (Melanie Griffin and Anna Webb, MADMF, personal communication).

Massachusetts requires vessels to have a permit to land mussels in the state, and landings are summarized by area, including whether mussels were harvested in state or federal waters. Based on Massachusetts data, none of the landings in recent years were attributed to federal waters, and well over 95% of landings came from Cape Cod Bay. No landings of mussels from the GSC HMA were identified in the federal vessel trip report database between 2011 and 2016.

Fishing Communities of Interest. The current state-waters fishery for mussels occurs largely out of Chatham, Massachusetts. American Mussel Harvesters, Inc. is based in North Kingston, RI and is one of the largest mussel processing and distribution companies in the Northeast (www.americannussel.com). Under the OHA2 regulations, harvesting with a mussel dredge is prohibited in the Great South Channel as of April 9, 2018. However, this framework may include alternatives that would allow access to the GSC for this fishery. Should this occur, there is potential for the fishery to expand, and perhaps other ports may become important in the future. Chatham and N. Kingston are considered the mussel fishery *Communities of Interest* for this action.

Map 5 – Mussel and Urchin Dredge exemption area



5.4.4 Other managed fisheries

In addition to Atlantic surfclams, many other fisheries could be impacted by the Alternatives under Consideration, particularly those that harvest species with EFH overlapping the Great South Channel (Table 1). Additionally, VTR and VMS data indicate that the Northeast multispecies fishery, the skate fishery and lobster fishery are all active in this area. Described here are the key fisheries and their respective fishing communities. Identifying specific

communities that may be impacted by alternatives that regard EFH protection is difficult and uncertain. Communities that are far removed from the GSC would likely only have minor or indirect impacts. For example, fishing ports in Downeast Maine are very important for the lobster fishery, but the fishery there is primarily active in waters within 12 nm of the coast of Maine; it is likely that any impacts from EFH protections in the GSC would be trace.

5.4.4.1 *Large mesh multispecies fishery*

Fishery overview. The overall trend since the start of sector management through 2014 has been a decline in groundfish landings and revenue (\$55M in FY2014) and the number of vessels with revenue from at least one groundfish trip (273 in FY2014). The groundfish fishery has had a diverse fleet of vessels sizes and gear types. Over the years, as vessels entered and exited the fishery, the typical characteristics defining the fleet changed as well. The decline in active vessels has occurred across all vessel size categories. Since FY2009, the 30' to < 50' vessel size category, which has the largest number of active groundfish vessels, experienced a decline from 305 to 145 active vessels. The <30' vessel size category, containing the least number of active groundfish vessels, experienced the largest reduction since FY2009 (34 to 14 vessels; Murphy *et al.* 2015; NEFMC 2017).

Fishing Communities of Interest – Commercial. There have been over 400 communities that have been the homeport or landing port to one or more commercial Northeast groundfish fishing vessels since 2008. Of these, 10 ports are considered primary commercial groundfish port communities. During FY 2009-FY 2013, primary ports had at least \$100,000 average annual revenue (for all species, not just groundfish) and are in the top ten ranking in regional quotient or local quotient (confidential ports excluded). Secondary ports are in the top 11-30 ranking in regional or local quotient (same revenue threshold; NEFMC 2018d). The commercial groundfish fishery *Communities of Interest* for this action are:

1. Identified as a primary or secondary commercial groundfish port in the Northeast Multispecies FMP; and
2. Have revenue derived from mobile bottom-tending gear in the Great South Channel, as identified through the Omnibus Habitat Amendment 2 (2012 only; OHA2 Volume 4, Table 73).

Under these criteria, there are 13 commercial groundfish fishery *Communities of Interest* for this action, from Maine to New York (Table 9).

Fishing Communities of Interest – Recreational. In the Northeast Multispecies FMP, criteria for identifying key recreational fishing communities have not been identified, but recreational fishing (party/charter and private angler) occurs throughout the Northeast region. The recreational groundfish fishery *Communities of Interest* for this action are:

1. Located on or near the coast in a coastal state from Chatham, Massachusetts to Long Island, New York; it is unlikely that substantial recreational fishing in proximity to the GSC would occur out of ports beyond that range to the north or south; and
2. Has a high level of engagement or reliance in recreational fishing using the NMFS Community Vulnerability Indicators, which portray the importance or level of

dependence on recreational fishing by coastal communities (Jepson & Colburn 2013). *The engagement index* incorporates the number of recreational fishing trips in 2011-2015 by fishing mode (private boat, charter boat, shore fishing) originating in the community (using MRIP data). *The reliance index* is a per capita measure using the same data as the engagement index, but divided by total population in the community; or

3. Have revenue derived from party-charter recreational fishing revenue in the Great South Channel, as identified through the Omnibus Habitat Amendment 2 (2012 only).

Under these criteria, there are 35 recreational groundfish fishery *Communities of Interest* for this action (Table 9). Ports with over 10 party-charter permits are considered primary ports. Amendment 8 to the Atlantic Herring FMP details the community vulnerability indicators for these ports (NEFMC 2018a). Just Point Judith, RI and Montauk, NY had party-charter revenue in 2012 associated with the GSC (OHA2 Volume 4, Table 75).

5.4.4.2 Northeast skate fishery

Fishery overview. Skates are harvested in two different fisheries, one for lobster bait and one for wings for food. The bait fishery is a more historical and directed skate fishery, involving vessels primarily from Southern New England ports that target a combination of little skates (>90%) and, to a much lesser extent, juvenile winter skates (<10%). The fishery for skate wings evolved in the 1990s as skates were promoted as “underutilized species,” and fishermen shifted effort from groundfish and other troubled fisheries to skates and dogfish. The wing fishery is largely an incidental fishery that includes a larger number of vessels located throughout the region, with a smaller portion of fishery targeting skate wings. Vessels tend to catch skates when targeting other species like groundfish, monkfish, and scallops and land them if the price is high enough. However, a smaller component of the fishery targets skates and account for a large amount of landings. In 2016, there were 415 active skate permits and the fishery had a total revenue of \$5.4M (NEFMC 2018c).

Fishing Communities of Interest. There were 78 communities where skate was landed for food, and 16 where skate was landed for bait, during 2015-2016, from all states Maine to North Carolina. The skate fishery *Communities of Interest* for this action are:

1. Identified as a top port in the Northeast skate FMP (Skate Framework 5); and
2. Have revenue derived from mobile bottom-tending gear in the Great South Channel, as identified through the Omnibus Habitat Amendment 2 (2012 only; OHA2 Volume 4, Table 73).

Under these criteria, there are five Northeast skate fishery *Communities of Interest* for this action, from Massachusetts to Connecticut (Table 9).

5.4.4.3 Sea scallop fishery

Fishery overview. During the period from fishing year 2009 to 2016, the scallop landings ranged from about 32 to 56 million pounds. Scallop revenue peaked in 2011 at \$591M (in inflation adjusted 2016 dollars) and declined to \$485M in 2016. The scallop fishery uses predominantly paired or single scallop dredges throughout the entire range of the fishery. To a lesser extent, and

mainly in the Mid-Atlantic region, the scallop fishery uses trawl gear. Most vessels land Atlantic sea scallops as shucked meats (the adductor muscle) but some vessels also land whole (in-shell) scallops. In 2016, there were 125 and 26 active vessels in the IFQ and Northern Gulf of Maine fisheries, respectively (NEFMC 2018b).

Fishing Communities of Interest. There have been 43-83 ports landing scallops annually between 2006 and 2017, but the top 10 ports, by percent of landings, have landed 83-92% of scallops annually (Scallop PDT, 2018). The scallop fishery *Communities of Interest* for this action are:

1. Identified as a top 10 port by percent of landings for either the limited access or the limited access general category scallop fleets, each year between 2013 and 2017; and
2. Have revenue derived from mobile bottom-tending gear in the Great South Channel, as identified through the Omnibus Habitat Amendment 2 (2012 only; OHA2 Volume 4, Table 73).

Under these criteria, there are 16 sea scallop fishery *Communities of Interest* for this action, from Massachusetts to Virginia (Table 9). New Bedford is the primary landing port; over 60% of the scallop landings during 2013-2017 occurred in New Bedford.

5.4.4.4 *Atlantic herring fishery*

Fishery overview. The Atlantic herring fishery occurs over the Northwest Atlantic shelf region from Cape Hatteras to Maine, including an active fishery in the inshore Gulf of Maine and seasonally on Georges Bank. The fishery generally occurs south of New England during the winter, and oftentimes as part of the directed mackerel fishery. The herring summer fishery generally occurs throughout the GOM and on GB as fish are available. In 2016, there were about 34 active limited access vessels, and about 70% of recent landings have been by midwater trawl vessels. Fishery revenue peaked in 2013 at about \$30M, and has been above \$20M per year since 2011 (NEFMC 2018a).

Fishing Communities of Interest. There have been over 150 communities that have been a homeport or landing port to one or more active Atlantic herring fishing vessels since 1997. These ports primarily occur from Maine to Virginia. Of these, 18 are considered the primary Atlantic herring port communities, as they have relatively high recent herring landings, medium-high or high engagement in or reliance on the fishery, or other factors (NEFMC 2018a). Due to the migratory nature of herring throughout the Greater Atlantic, all the primary herring ports are *Communities of Interest* for this action (Table 9).

5.4.4.5 *Lobster fishery*

The American lobster fishery has seen incredible expansion in effort and landings over the last 40 years and is now one of the top fisheries on the U.S. Atlantic coast. In the 1920s, lobster landings were about 11M lbs. Landings were stable between 1950 and 1975, around 30M pounds; however, from 1976 – 2008, landings tripled, reaching 92M pounds in 2006. Landings continued to increase and peaked in 2013 at over 150M pounds. Landings leveled off but remained high at 147M pounds in both 2014 and 2015, but again jumped to over 158M pounds

(over \$660M) in 2016. The largest contributors to the fishery are Maine and Massachusetts, with 83% and 11% of the recent landings, respectively. Landings, in descending order, also occurred in New Hampshire, Rhode Island, New Jersey, Connecticut, New York, Maryland, Delaware, and Virginia (ASMFC 2017).

Landings typically occur from inshore areas, and lobsters are most abundant inshore from Maine through New Jersey, with abundance declining from north to south. Offshore, lobsters occur from Maine through North Carolina. Area 1 (inshore Gulf of Maine) has the highest landings, 80% of total harvest between 1981 and 2012. This is followed by LCMA 3 (offshore), 9% of total landings. Dramatic declines in the catch from inshore SNE since 1999 have been attributed to waters increasingly exceeding the lobster thermal stress threshold of 20°C (ASMFC 2015).

There was an average of 8,315 vessels issued commercial lobster permits for the fishery in state waters each year between 2009 and 2013, and 3,080 vessels were issued federal permits, though in most cases, a vessel holding a federal permit also holds a state permit. Thus, there are about 8,300 vessels in the lobster fishery. The State of Maine has issued the largest number of state permits, recently averaging 5,163 (62%). For Maine, about 85% of the permits are active (~4,400). For New Hampshire, about 70% of the permits issued were active during 2009-2013.

Fishing Communities of Interest. The ASMFC has not identified key ports in the American lobster fishery, but lobster is landed in many port communities on the Atlantic coast. The lobster fishery *Communities of Interest* for this action are:

1. Located on or near the coast in a coastal state from Chatham, Massachusetts to Long Island, New York; it is unlikely that substantial lobster fishing in proximity to the GSC would occur out of ports beyond that range to the north or south; and
2. Was within the top 20 ports for lobster landed value in 2015; or
3. Has the homeport or primary landing port to at least 10 federal lobster vessels.

Under these criteria, there are eight lobster fishery *Communities of Interest* for this action (Table 9). In 2015, 18 of the top 20 ports for lobster landed value were in Maine (primarily Midcoast to eastern Maine), and two were in Massachusetts. As identified for Amendment 8 to the Atlantic Herring FMP (NEFMC 2018a), these 20 top ports are considered the primary lobster ports. Also in 2015, there were 2,297 federal lobster licenses issued to vessels from 279 home ports (15 states) and 273 primary landing ports (12 states). Of these, there were 63 ports that were either the home port or primary landing port to at least 10 federal lobster vessels, and these are considered secondary ports.

5.4.5 Co-occurrence of fisheries within communities

In all, about 60 communities have been identified as potentially impacted by this action from Maine to Virginia (Table 9). The fisheries potentially impacted co-occur within many of these ports. For example, Gloucester, Narragansett, and Montauk are important to each fishery potentially impacted.

Table 9 - Communities of interest for the fisheries potentially impacted by this action

State	Port	Surfclam/ Mussel	Groundfish		Skate	Sea scallop	Atlantic herring	Lobster
			Comm.	Rec.				
ME	Jonesport	Su					H*	
	Gouldsboro						H*	
	Stonington						H*	
	Rockland						H*	
	Vinalhaven						H*	
	Matinicus						H*	
	South Bristol						H*	
	Sebasco						H*	
	Portland			G*				H*
NH	Portsmouth	Su						
MA	Gloucester	Su	G*	R*			H*	
	Boston		G*					
	Hingham	Su						
	Marshfield (Green Harbor, Cedar Crest)			R*				
	Provincetown	Su*						
	Chatham	M*	G*	R	Sk*	Sc		L
	Harwich (Harwich Port)	Su*	G	R		Sc		
	Hyannis/Barnstable/Hyannisport	Su*				Sc		
	Falmouth			R				
	Woods Hole		G					
	Bourne			R				
	Wareham (W. Wareham, Onset)			R				
	Nantucket		G	R				
	Menemsha							L
	New Bedford/Fairhaven	Su*	G*		Sk*	Sc*	H*	L*
Westport				R			L	
RI	Tiverton			R				
	Bristol			R				
	Newport		G		Sk*	Sc	H*	L
	Jamestown			R				
	Warwick			R				
	Narragansett (Pt. Judith)		G*	R*	Sk*	Sc	H*	L
	Kingstown (N. and S. Kingston, Wakefield-Peacedale)	M*		R			H*	
	Charlestown (Carolina)			R				
CT	Stonington (Mystic, Pawcatuck)		G	R		Sc		L
	Groton (Noank)			R				
	New London				Sk*			
	Waterford			R				
	East Lyme (Niantic)			R				

State	Port	Surfclam/ Mussel	Groundfish		Skate	Sea scallop	Atlantic herring	Lobster
			Comm.	Rec.				
	Old Lyme			R				
	Old Saybrook			R				
	Milford			R				
NY	Northport			R				
	Brookhaven (Port Jefferson, Mt. Sinai, Moriches, Shirley, Mastic Beach)			R				
	Orient			R				
	Montauk		G	R*		Sc	H*	L
	Hampton Bays/Shinnecock			R			H*	
	Islip	Su						
	Babylon (Oak Beach-Captree)			R				
	Hempstead (Freeport, Wantagh, Pt. Lookout, Oceanside)	Su*		R				
NJ	Long Beach			R				
	Point Pleasant	Su*				Sc		
	Barnegat Light					Sc	H*	
	Atlantic City	Su*						
	Wildwood	Su						
MD	Cape May	Su*				Sc	H*	
	Ocean City	Su*						
VA								
	Chincoteague					Sc		
	Seaford					Sc		
	Hampton					Sc		
	Newport News					Sc		

Note: The fisheries and ports identified are those more likely to be impacted by this action.
* Primary port

5.4.6 Port Descriptions

Described here are several of the primary ports for the surfclam fishery. Information in this section is largely based on demographic data collected by the U.S. Census and fishery data collected by NMFS, much of which are available on the NEFSC website (NEFSC 2017c).

5.4.6.1 Massachusetts ports

5.4.6.1.1 Hyannis/Barnstable, MA

General: Hyannis is a fishing community, a village within the town of Barnstable within Barnstable County, Massachusetts. In 2016, the town of Barnstable had a population of 44,498, a 2% decrease from the year 2010 (45,193). In 2012-2016, 0.7% of the civilian employed population aged 16 years and over worked in agriculture, forestry, fishing, hunting, and mining occupations in Barnstable; the poverty rate was 10.7%; and the population was 97% white, non-

Hispanic (U.S. Census 2018). The commercial fishing engagement and reliance indices for the town of Barnstable are medium-high and medium, respectively (Jepson & Colburn 2013).

In 2016, total landings in Barnstable County were valued at \$70M (dealer data), and the top five species by value were American lobsters, oysters, sea scallops, spiny dogfish, and Atlantic surfclams (Table 10), comprising about 61% of that total. American lobsters were valued at \$16M, or 24% of total landings, landed by over 105 vessels and sold to over 42 dealers. The town of Barnstable (including Hyannis, Hyannisport, and Osterville), in 2016, was the registered homeport or primary landing port for 12 and 19 federal fishing permits (i.e., vessels), respectively (GARFO 2018) and total landings was valued at \$9.4M, 13% of the Barnstable County total and 2% of the state-wide total (\$551M; dealer data).

Surfclam fishery: In 2016, Atlantic surfclams was the fifth most valuable species landed in Barnstable County with a revenue of \$2.9M. These landings are attributed to seven Atlantic surfclam vessels, sold to seven dealers (Table 10; logbook data). The MAFMC Advisory Panel has indicated that Hyannis is one of five ports where “most of the fleet is fishing out of” (MAFMC 2018b, p. 2). The commercial surfclam fishing engagement index for the town of Barnstable (incl. Hyannis and Hyannisport) was generally low from 1990 to 2010, but was medium in 2011 and high in 2012 and 2013 (Table 7) (Colburn *et al.* 2017).

Other fisheries: Barnstable County contains several ports important to the fisheries potentially impacted by this action other than surfclams (Table 9). The mussel fishery is currently based primarily out of Chatham. For the commercial groundfish fishery, Chatham is a primary port and Harwich and Woods Hole are secondary ports. Chatham, Harwich and Falmouth are important for the recreational groundfish fishery. Chatham is important for the skate fishery. Chatham, Harwich, and Barnstable are important for the scallop fishery, and Chatham is important for the lobster fishery.

Table 10 - Top five species landed by value in Barnstable County MA, 2016

Species	Nominal revenue (\$)	Vessels	Dealers
American lobster	\$16M	106	41
Oyster	\$12M	7	17
Sea scallops	\$8.5M	50	20
Spiny dogfish	\$3.1M	49	6
Atlantic surfclam	\$2.9M	7	7

Source: Surfclam data from logbooks. All other species from dealer data, as of June 8, 2018.

5.4.6.1.2 Fairhaven, MA

General: Fairhaven is a fishing community in Bristol County, Massachusetts. In 2016, Fairhaven had a population of 16,078, a 1% increase from the year 2010 (15,873). In 2012-2016, 0.9% of the civilian employed population aged 16 years and over worked in agriculture, forestry, fishing, hunting, and mining occupations in Fairhaven; the poverty rate was 9.4%; and the population was 91% white, non-Hispanic (U.S. Census 2018). The commercial fishing engagement and reliance indices for Fairhaven are high and low, respectively (Jepson & Colburn 2013).

In 2016, total landings in Fairhaven were valued at \$22M, 4% of the state-wide total (\$551M; dealer data). The top five species by value included sea scallops, Atlantic surfclams, and whelk (Table 11), comprising 87% of that total. Sea scallops were valued at \$17M, or 77% of total landings, landed by 26 vessels and sold to eight dealers. In 2016, Fairhaven was the registered homeport or primary landing port for 24 and 29 federal fishing permits (i.e., vessels), respectively (GARFO 2018).

Surfclam fishery: In 2016, Atlantic surfclams was one of the top five species by value in Fairhaven, with a revenue of \$1.7M. These landings are attributed to four Atlantic surfclam vessels, sold to seven dealers.

Other fisheries: Fairhaven, by itself and in combination with neighboring New Bedford, is a port important to the fisheries potentially impacted by this action other than surfclams (Table 9). New Bedford and Fairhaven combined is a primary port for the commercial groundfish fishery, and is important for the skate, scallop, herring, and lobster fisheries.

Table 11 - Top five species landed by value in Fairhaven MA, 2016

Species	Nominal revenue (\$)	Vessels	Dealers
Sea scallop	\$17M	26	6
Atlantic surfclam	\$1.7M	4	7
Whelk	\$0.49M	11	3
<i>Note:</i> Data for one of the five top species landed are confidential.			
<i>Source:</i> Surfclam data from logbooks. All other species from dealer data, as of June 8, 2018.			

5.4.6.1.3 New Bedford, MA

General: New Bedford is a fishing community in Bristol County, Massachusetts. In 2016, New Bedford had a population of 94,988, a 0.1% decrease from the year 2010 (95,072). In 2012-2016, 2% of the civilian employed population aged 16 years and over worked in agriculture, forestry, fishing, hunting, and mining occupations in New Bedford; the poverty rate was 23.5%; and the population was 65% white, non-Hispanic, 19% Hispanic or Latino, and 6% Black or African American alone (U.S. Census 2018). The commercial fishing engagement and reliance indices for New Bedford are high and medium, respectively (Jepson & Colburn 2013).

In 2016, total landings in New Bedford were valued at \$343M, 64% of the state-wide total (\$608M; dealer data). The top five species landed by value included sea scallops, Atlantic surfclams, American lobster, and winter flounder (Table 12), comprising 82% of that total. Sea scallops were valued at \$252M, or 73% of total landings, landed by 269 vessels and sold to 28 dealers. In 2016, New Bedford was the registered homeport or primary landing port for 223 and 245 federal fishing permits (i.e., vessels), respectively (GARFO 2018).

Surfclam fishery: In 2016, Atlantic surfclams was one of the top five species by value in New Bedford, with a revenue of \$13M. These landings are attributed to 14 Atlantic surfclam vessels, sold to 10 dealers (Table 12). The MAFMC Advisory Panel has indicated that New Bedford is one of five ports where “most of the fleet is fishing out of” (MAFMC 2018b, p. 2). The

commercial surfclam fishing engagement index for New Bedford was generally medium high to high 1990 to 2010, and was high from 2011 to 2013 (Table 7) (Colburn *et al.* 2017).

Other fisheries: New Bedford, by itself and in combination with neighboring Fairhaven, is a port important to the fisheries potentially impacted by this action other than surfclams (Table 9). New Bedford and Fairhaven combined is a primary port for the commercial groundfish fishery, and is important for the skate, scallop, herring, and lobster fisheries.

Table 12 - Top five species landed by value in New Bedford MA, 2016

Species	Nominal revenue (\$)	Vessels	Dealers
Sea scallop	\$252M	269	28
Atlantic surfclam	\$13M	14	10
American lobster	\$9.4M	86	19
Winter flounder	\$5.5M	59	6
<i>Note:</i> Data for one of the five top species landed are confidential.			
<i>Source:</i> Surfclam data from logbooks. All other species from dealer data, as of June 8, 2018.			

5.4.6.2 New York ports

5.4.6.2.1 Oceanside, NY

General: Oceanside is a fishing community, a hamlet within the town of Hempstead within Nassau County, New York (Hempstead also includes the communities of Freeport, Wantagh, and Pt. Lookout). In 2016, Oceanside had a population of 30,813, a 4% decrease from the year 2010 (32,109). In 2012-2016, 0.2% of the civilian employed population aged 16 years and over worked in agriculture, forestry, fishing, hunting, and mining occupations in Oceanside; the poverty rate was 5.2%; and the population was 85% white, non-Hispanic (U.S. Census 2018). The commercial fishing engagement and reliance indices for Oceanside are low and medium, respectively (Jepson & Colburn 2013). In 2016, Oceanside was the registered homeport or primary landing port for two and seven federal fishing permits (i.e., vessels), respectively (GARFO 2018). In 2016 (and 2017), landings in Oceanside were confidential, so port data are not reported here further.

Surfclam fishery: Although fishing activity in Oceanside is confidential, the MAFMC Advisory Panel has indicated that it is one of five ports where “most of the fleet is fishing out of” (MAFMC 2018b, p. 2).

Other fisheries: Oceanside is a port important to the fisheries potentially impacted by this action other than surfclams, particularly the recreational groundfish fishery (Table 9).

5.4.6.3 New Jersey ports

5.4.6.3.1 Point Pleasant, NJ

General: Point Pleasant is a fishing community in Ocean County, NJ. In 2016, Point Pleasant had a population of 18,464, a 0.4% increase from the year 2010 (18,392). In 2012-2016, 0.6% of the civilian employed population aged 16 years and over worked in agriculture, forestry, fishing,

hunting, and mining occupations in Point Pleasant; the poverty rate was 6.3%; and the population was 95% white, non-Hispanic (U.S. Census 2018). The commercial fishing engagement and reliance indices for Point Pleasant are high and medium, respectively (Jepson & Colburn 2013).

In 2016, total landings in Point Pleasant were valued at \$31M, 16% of the state-wide total (\$189M; dealer data). The top five species landed by value included sea scallops, summer flounder, and scup (Table 13), comprising 59% of that total. Sea scallops were valued at \$15M, or 48% of total landings, landed by 69 vessels and sold to 16 dealers. In 2016, Point Pleasant was the homeport or primary landing port for 52 and 55 federal fishing permits (i.e., vessels), respectively (GARFO 2018).

Surfclam fishery: In 2016, Atlantic surfclams landed in Point Pleasant were valued at \$335K. These landings are attributed to seven Atlantic surfclam vessels, sold to four dealers (logbook data). The MAFMC Advisory Panel has indicated that it is one of five ports where “most of the fleet is fishing out of” (MAFMC 2018b, p. 2). The commercial surfclam fishing engagement index for Point Pleasant was generally low from 1990 to 1999 but has fluctuated between low and high since 2000 and was medium-high to high in 2011 to 2013 (Table 7) (Colburn *et al.* 2017).

Other fisheries: Point Pleasant is a port important to the fisheries potentially impacted by this action other than surfclams, particularly the sea scallop fishery (Table 9).

Table 13 - Top five species landed by value in Point Pleasant, 2016

Species	Nominal revenue (\$)	Vessels	Dealers
Sea scallop	\$15M	69	16
Summer flounder	\$2.1M	49	15
Scup	\$1.2M	31	12

Note: Data for two of the five top species landed are confidential.
Source: Surfclam data from logbooks. All other species from dealer data, as of June 8, 2018.

5.4.6.3.2 Atlantic City, NJ

General: Atlantic City is a fishing community within Atlantic County, New Jersey. In 2016, Oceanside had a population of 39,306, a 0.6% decrease from the year 2010 (39,558). In 2012-2016, 0.1% of the civilian employed population aged 16 years and over worked in agriculture, forestry, fishing, hunting, and mining occupations in Atlantic City; the poverty rate was 37%; and the population was 36% Black or African American alone, 28% Hispanic or Latino, 18% white, non-Hispanic, and 16% Asian alone (U.S. Census 2018). The commercial fishing engagement and reliance indices for Atlantic City are high and low, respectively (Jepson & Colburn 2013).

In 2016, total landings in Atlantic City were valued at \$20M, 11% of the state-wide total (\$189M; dealer data). The top five species landed by value included Atlantic surfclams, sea scallops, and American lobster (Table 14), comprising 71% of that total. In 2016, Atlantic City was the registered homeport or primary landing port for 32 and 37 federal fishing permits (i.e., vessels), respectively (GARFO 2018).

Surfclam fishery: In 2016, Atlantic surfclams was one of the top five species by value in Atlantic City, with a revenue of \$8.8M. These landings are attributed to 16 Atlantic surfclam vessels, sold to 4 dealers (Table 14). The MAFMC Advisory Panel has indicated that it is one of five ports where “most of the fleet is fishing out of” (MAFMC 2018b, p. 2). The commercial surfclam fishing engagement index for Atlantic City was low from 1990 to 2003, but was high from 2004 to 2013 (Table 7) (Colburn *et al.* 2017).

Other fisheries: Atlantic City is a port involved in the fisheries potentially impacted by this action other than surfclams, particularly the sea scallop and American lobster fisheries. However, Atlantic City is not considered a primary or key port for those fisheries (Table 9).

Table 14 - Top five species landed by value in Atlantic City, 2016

Species	Nominal revenue (\$)	Vessels	Dealers
Atlantic surfclam	\$8.8M	7	3
Sea scallop	\$2.7M	9	4
American lobster	\$0.0M	3	3

Note: Data for two of the five top species landed are confidential.
Source: Surfclam data from logbooks. All other species from dealer data, as of June 8, 2018.

5.5 Protected resources

There are numerous species inhabiting the affected environment of the surfclam and ocean quahog fisheries that are afforded protection under the Endangered Species Act (ESA) of 1973 (i.e., for those designated as threatened or endangered) and the Marine Mammal Protection Act of 1972 (MMPA). provides protected species of marine mammals, sea turtles, and fish (ESA listed and non-listed species) that occur within the management units for surfclam and ocean quahog. Detailed descriptions of the species listed in Table 15, including their environment, ecological relationships and life history information including recent stock status, is available at: <http://www.greateratlantic.fisheries.noaa.gov/Protected/>.

The commercial fisheries for surfclam and ocean quahogs are prosecuted with clam dredges, a type of bottom tending mobile gear. There have been no observed interactions of any protected species of marine mammals, sea turtles, or fish with clam dredges and therefore, operation of surfclam and ocean quahog fisheries are not expected to pose any serious injury or mortality risk to these species, as shown in Table 15 and the following resources:

- http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html;
- http://www.nmfs.noaa.gov/pr/sars/pdf/ao2013_tm228.pdf;
- <http://www.nmfs.noaa.gov/pr/interactions/lof/>.

Table 15 – Species protected under the ESA and/or MMPA that may occur in the affected environment

Species	Status	Potentially affected by this action?
Cetaceans		
North Atlantic right whale (<i>Eubalaena glacialis</i>)	Endangered	No

Species	Status	Potentially affected by this action?
Humpback whale (<i>Megaptera novaeangliae</i>)	Endangered	No
Fin whale (<i>Balaenoptera physalus</i>)	Endangered	No
Sei whale (<i>Balaenoptera borealis</i>)	Endangered	No
Blue whale (<i>Balaenoptera musculus</i>)	Endangered	No
Sperm whale (<i>Physeter macrocephalus</i>)	Endangered	No
Minke whale (<i>Balaenoptera acutorostrata</i>)	Protected	No
Pilot whale (<i>Globicephala spp.</i>) ¹	Protected	No
Risso's dolphin (<i>Grampus griseus</i>)	Protected	No
Atlantic white-sided dolphin (<i>Lagenorhynchus acutus</i>)	Protected	No
Short Beaked Common dolphin (<i>Delphinus delphis</i>) ²	Protected	No
Bottlenose dolphin (<i>Tursiops truncatus</i>) ³	Protected	No
Harbor porpoise (<i>Phocoena phocoena</i>)	Protected	No
Sea Turtles		
Leatherback sea turtle (<i>Dermochelys coriacea</i>)	Endangered	No
Kemp's ridley sea turtle (<i>Lepidochelys kempii</i>)	Endangered	No
Green sea turtle (<i>Chelonia mydas</i>), North Atlantic DPS	Threatened	No
Loggerhead sea turtle (<i>Caretta caretta</i>), Northwest Atlantic DPS	Threatened	No
Hawksbill sea turtle (<i>Eretmochelys imbricate</i>)	Endangered	No
Fish		
Shortnose sturgeon (<i>Acipenser brevirostrum</i>)	Endangered	No
Atlantic salmon (<i>Salmo salar</i>)	Endangered	No
Atlantic sturgeon (<i>Acipenser oxyrinchus</i>)		
<i>Gulf of Maine DPS</i>	Threatened	No
<i>New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS</i>	Endangered	No
Cusk (<i>Brosme brosme</i>)	Candidate	No
Pinnipeds		
Harbor seal (<i>Phoca vitulina</i>)	Protected	No
Gray seal (<i>Halichoerus grypus</i>)	Protected	No
Harp seal (<i>Phoca groenlandicus</i>)	Protected	No
Hooded seal (<i>Cystophora cristata</i>)	Protected	No
Critical Habitat		
North Atlantic Right Whale (expanded January 2016)	ESA-listed	No
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA-listed	No
¹ Due to the difficulties in discriminating short finned (<i>G. melas melas</i>) and long finned (<i>G. macrorhynchus</i>) pilot whales at sea, they are often just referred to as <i>Globicephala spp.</i> ² Called "common dolphin" prior to 2008 ³ Includes the Western N. Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks.		

6 Environmental Impacts of the Alternatives

6.1 Impacts analysis methods by VEC

6.1.1 Fishery resources and EFH

6.1.2 Human communities

6.1.3 Protected resources

6.2 Impacts to fishery resources and EFH

6.3 Impacts to human communities

6.4 Impacts to protected resources

7 Cumulative Effects Analysis

8 Compliance with the Magnuson Stevens Fishery Conservation and Management Act

9 Compliance with the National Environmental Policy Act

10 Relationship to other Applicable Law

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