

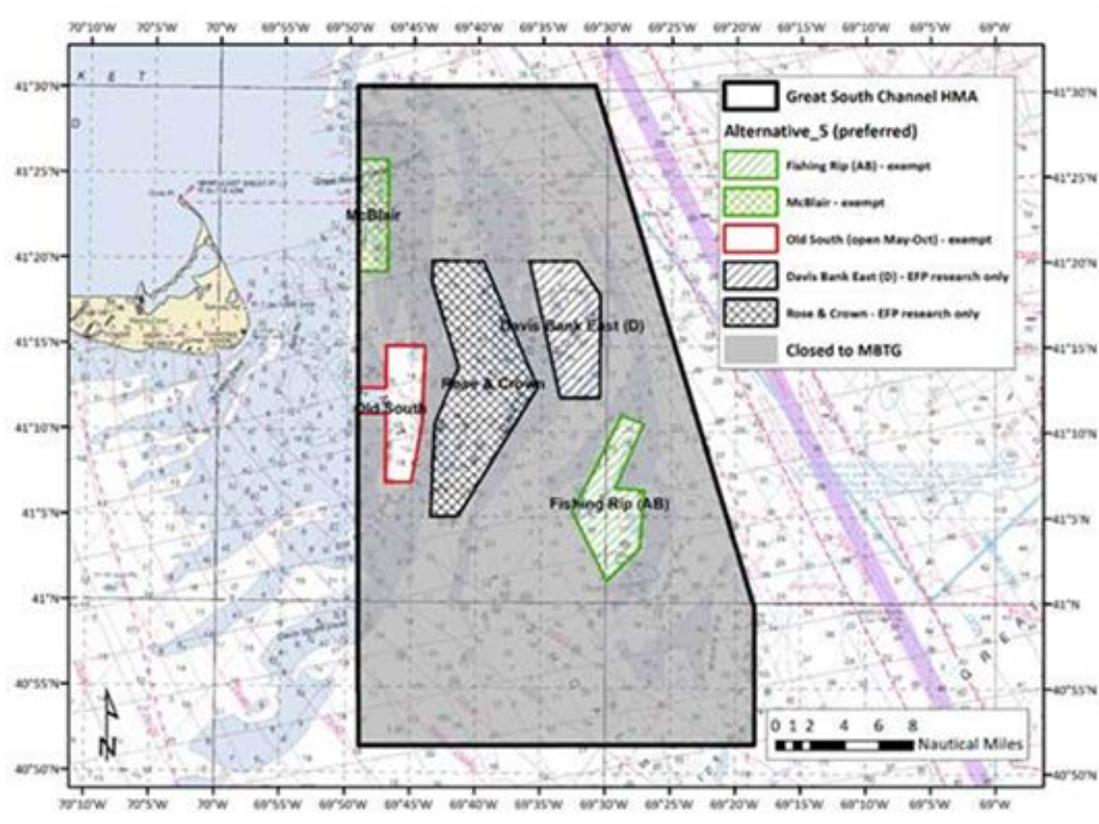


## New England Fishery Management Council

50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116

John F. Quinn, J.D., Ph.D., *Chairman* | Thomas A. Nies, *Executive Director*

### Research Objectives for the Great South Channel Habitat Management Area



#### **Background**

In April 2015, the New England Fishery Management Council (NEFMC) approved the Great South Channel Habitat Management Area (HMA) and recommended the Northeast corner of the area be closed to all dredges and bottom trawls, and the remainder of the area be closed to bottom trawls and scallop dredges with a 1-year exemption for clam dredges. That year allowed for consideration of a program for clam dredges to access portions of this HMA that would not negatively impact sensitive fish habitat. On April 9, 2018, National Oceanic and Atmospheric Administration (NOAA) Fisheries implemented regulations that started the clock for the one-year exemption for clam dredge access which expired on April 9, 2019.

In December 2018, NEFMC took final action on a framework adjustment action that identified three clam access areas (which include exemptions for mussel dredges), plus two other areas that would be prioritized for research (Rose and Crown and Davis Bank East). The Council's intent was that both fishermen and scientists will work toward obtaining better information to define where Atlantic surfclams and mussels can be harvested without impacting sensitive fish habitat in those areas. This document includes research objectives developed by the Habitat Plan Development Team (PDT) to support future work, and a framework for addressing those priorities.

### ***Roles and responsibilities***

**NEFMC:** One of eight regional councils established by federal legislation in 1976, charged with conserving and managing fishery resources from 3 to 200 miles off the coasts of Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut. NEFMC develops fishery management plans and plan amendments and submits these plans to NOAA Fisheries for approval and implementation. These fishery management plans must adhere to ten national standards identified in the Magnuson Stevens Act, and meet other requirements such as designation of essential fish habitat (EFH), and minimization of impacts to EFH to the extent practicable. The Council's planning process and plan amendments must also comply with other federal laws, including the National Environmental Policy Act and the Administrative Procedures Act, which in part, specify opportunities for public involvement in the process.

NEFMC guides fishery-related research completed in the northeast region by developing and disseminating a list of research priorities, which are reviewed annually, and through the research set aside programs in the scallop, monkfish and herring plans. NEFMC is not a research organization and does not have in-house research capabilities. With respect to research planning in the Great South Channel HMA, the roles of the Council are to identify priorities, assist with scoping out specific projects (through the Habitat PDT or its members), explain (to the extent possible) how the Council might use research results in management, and then evaluate and make use of any information gathered, consistent with guidelines on use of best scientific information available and the Council's operational procedures.<sup>1</sup> On an ongoing basis, Council staff and the Habitat PDT will endeavor to track future research and periodically update the Habitat Committee about the kinds of research that are being conducted.

**Greater Atlantic Regional Fisheries Office (GARFO, part of NOAA Fisheries):** GARFO fulfills policy development and regulatory fishery management functions for NOAA Fisheries. The regional administrator is a member of the Council and provides guidance on the development of management measures throughout the FMP process. GARFO Habitat Conservation Division (HCD) staff work closely with the Council to designate EFH and develop management measures to minimize impacts of fishing on those habitats. HCD staff and the Councils also collaborate on NOAA's consultation work, which seeks to minimize the impacts of federally permitted (fishing and non-fishing) projects on EFH.

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<sup>1</sup> These are detailed in the Council's Operations Handbook. See here: [https://s3.amazonaws.com/nefmc.org/UPDATE\\_fin04.2019\\_Operations\\_Handbook\\_revised\\_190509\\_140046.pdf](https://s3.amazonaws.com/nefmc.org/UPDATE_fin04.2019_Operations_Handbook_revised_190509_140046.pdf).

In a research context, GARFO reviews and approves exempted fishing permits (EFPs), which would be required for certain types of research activities conducted from commercial fishing vessels. The Council can comment to GARFO on whether permits should be approved. GARFO staff, independently as well as through the PDT, can help scope out specific research projects.

**Northeast Fisheries Science Center (NEFSC, also part of NOAA Fisheries):** NEFSC provides science-based advice, analyses, and data to the Councils and GARFO. NEFSC activities are guided by a 5-year strategic plan.<sup>2</sup> One of NEFSC's focal areas is to "improve understanding of the influence of climate, ecosystem, habitat factors, and species relationships on living marine resource dynamics in order to provide integrated scientific advice to managers." NEFSC activities are bounded by Congressional funding authorizations which allocate money to the Science Centers in specific categories. In general, there is very limited capacity to do field, laboratory, or desktop science that is identified on an ad-hoc basis outside of the long-term planning process.

Pertinent to the Great South Channel HMA, routine NEFSC survey programs collect data on and around Nantucket Shoals. However, sampling of this area has been incomplete given the challenges associated with operating NOAA survey vessels on the shoals, so portions of the area are poorly surveyed. NEFSC scientists, independently as well as through the PDT, can help scope out specific research projects.

#### ***Areas targeted for work***

Rose and Crown and Davis Bank East were identified by the Council as two areas where exemptions might be identified through a future action and research could be conducted. Both areas have Atlantic surfclams in harvestable quantities, and the Rose and Crown area is known to have mussel beds. Overall, little is known about the mussel resource in the HMA, and beds may be present in the Davis Bank East area as well. Both areas have structured benthic habitats of interest from a conservation perspective.

The Council specified in the December 2018 framework that clam and mussel dredges could be used in these areas under an approved EFP. This is consistent with underlying Council policy established via Omnibus Habitat Amendment 2 (OHA2) recommending that habitat-related research using fishing gear be allowed within HMAs, provided that appropriate research permits are obtained and the objectives of the HMA are not compromised. This policy was adopted through OHA2 in response to a general concern that it has been difficult to obtain permits to conduct research inside HMAs, even if that research was habitat-focused. The thinking was that by specifying habitat research as an appropriate role for HMAs that it would facilitate approval of these types of permits by NOAA Fisheries.

#### ***Research objectives for the GSC HMA***

The Habitat PDT identified four objectives for focused habitat research which can be addressed through study of the Rose and Crown and Davis Bank East closed areas. These objectives are numbered for reference but are interrelated and thus would not necessarily be addressed in sequence. While there is presently data and analysis available related to each of the objectives,

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<sup>2</sup> <https://www.nefsc.noaa.gov/rcb/stratplan/nefsc-strategic-science-plan.pdf>

the information could be improved and updated to enhance our understanding of current conditions in the HMA. Addressing these objectives will allow the Council to prioritize sections of the HMA for mobile bottom-tending gear closure vs. dredge exemptions, contingent upon assessments of habitat vulnerability and function vs. utility as fishing grounds.

1. Improve the Council's understanding of the distribution of living and non-living habitat features within the GSC HMA, including topography, substrate, epifauna, and infauna (i.e., develop habitat maps).
2. Improve the Council's understanding of habitat stability including epifaunal persistence in relation to substrate type, tidal flows and storm events.
3. Improve the Council's understanding of habitat vulnerability to mussel and clam dredges. Vulnerability includes both the nature of habitat/gear interactions (susceptibility) and recovery rates.
4. Improve the Council's understanding of why the GSC HMA is important to managed species, such as Atlantic cod.

Studies should build upon existing knowledge and seek to generate novel results. As an overarching objective, in studies where sampling is required, any research undertaken should be designed in a manner that is statistically rigorous and effectively supports decision making. For any before-after-control-impact (BACI) or similar studies, observations should be made in both experimental and reference sites, with power analyses conducted ahead of time to ensure that sufficient numbers of replicates are obtained. An important aspect of this research program is understanding how habitats change over time, and therefore any study should include plans to revisit stations at intervals following initial sampling/impact to reassess habitat condition. The PDT identified a range of structural habitat features of interest when developing information to support the clam framework<sup>3</sup>. Where possible, habitat mapping efforts as well as BACI-type studies should catalog these features so that previous data can be compared to new data.

For research activities expected to have negative impacts on EFH, there should be a clear explanation of why the proposed research needs to be conducted within the closed portion of the HMA. Specifically, if sites outside the HMA, or within the three existing exemption areas, would be suitable for addressing the objectives above, the use of these alternative locations should be explored as part of EFP development.

### *Objective 1*

Although we have a broad scale understanding of the distribution of biotic and abiotic habitat features within much of the HMA, we do not have habitat maps at fine spatial scales. Fine scale habitat data in combination with fishing effort data would help the Council to understand which habitat features are targeted or avoided by vessels fishing with clam or mussel dredges. In addition to issues of resolution, the habitat characteristics of certain areas of the HMA are poorly understood. Specifically, there is limited information on habitat characteristics of the planned exemption areas, McBlair, Old South, and Fishing Rip. A more comprehensive characterization of habitats throughout the HMA would help the Council to assess tradeoffs between currently proposed and potential future exemption areas in terms of habitat benefits vs. economic value to

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<sup>3</sup> See here for details: [https://s3.amazonaws.com/nefmc.org/3c-Appendix-A\\_Image-analysis-approach.pdf](https://s3.amazonaws.com/nefmc.org/3c-Appendix-A_Image-analysis-approach.pdf)

the fishery. The recommendation is to prioritize work in Rose and Crown and Davis Bank because these are the areas of industry interest for future clam and mussel dredging exemptions.

Additional habitat mapping will be foundational to designing experiments to address questions about the effects of natural disturbance (*Objective 2*) and fishing gear (*Objective 3*) on these habitats. Preliminary mapping will ensure that reference and experimental sites have similar characteristics, increasing the likelihood that robust conclusions can be drawn from any gear effects experiments. Maps of mussel habitats are of particular interest because mussels are both target species and a habitat for managed resources. At present, the distribution of mussels in the HMA is poorly understood. Given the August 2017 dredge survey and the extensive commercial fishery that has occurred in the HMA, the distribution of surfclams is much better known, and is not recommended as a study focus at this time. A variety of different methods might be used to create habitat maps, including but not limited to towed camera, drop camera, and acoustics.

### *Objective 2*

Nantucket Shoals is a dynamic area, shaped by tidal currents and episodic events. Finer-grained sediments on the shoals can be redistributed by these currents. Nonetheless, benthic surveys have observed the occurrence of longer-lived species in the HMA, despite these dynamic conditions. The relationship between natural and fishing gear disturbance will be a factor in any future decisions regarding fishery exemptions. In this context, it is important that we learn more about the variation in the natural environmental conditions in these two areas and how they affect the susceptibility and recovery times of benthic habitats (including epifauna).

### *Objective 3*

Vulnerability is understood here to mean the susceptibility of seafloor habitat features to the negative effects of fishing gear as well as the duration of those effects (i.e. the recovery rates of the habitat features from disturbance). This conceptual framework was established through the Council's Swept Area Seabed Impact Model (NEFMC 2011) and carries through in recent updates to this decision support tool, termed the Northeast Fishing Effects Model (report forthcoming; for a draft see here: <https://www.nefmc.org/calendar/may-9-2019-habitat-committee-meeting>). Although there are studies from other areas, there is no information specific to the HMA on the resilience of benthic habitats, including clam and mussel beds as well as other seabed types, to dredging. More needs to be known about the vulnerability of benthic habitats to the effects of clam and mussel dredges. These studies could help the Council to identify discrete habitat types, conditions, and locations where fishing might be conducted with minimal habitat impacts.

Impact and reference sites should be identified based on habitat characteristics (*Objective 1*). Experiments designed to provide information on the gear effects of clam and mussel dredges should also employ intensities of fishing effort intended to match approximate activity in the commercial fishery. Ideally recovery from gear effects as well as conditions at the reference sites would be examined at multiple time steps.

### *Objective 4*

There are a number of studies demonstrating the importance of complex bottom habitats in providing optimum conditions that enhance the survival of recently-settled and older juvenile fish (see NEFMC 2016, Vol. 1 for a detailed summary). 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). If suitable habitats are limited, or if the abundance of juveniles that rely on these critical habitats exceeds the amount of suitable habitat that is available, ecological “bottlenecks” to recruitment are created. Fishing gears and practices that reduce the quality and quantity of suitable habitat for these species can be expected to reduce recruitment rates and stock productivity. Cod have been the subject of a considerable amount of research in the Northwest Atlantic aimed at defining the affinity of different life stages with complex bottom habitats and the effect of habitat type on growth and survival, particularly for the younger age groups. Several 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 and 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 (Lindholm et al. 1999, Borg et al. 1997, Gotceitas et al. 1995, and other refs).

Protection of bottom habitats that are most critical for the survival and growth of juvenile groundfish, especially cod, would provide the greatest benefit to managed fishery resources in the HMA. Studies that improve the Council’s understanding of why this area is so important for managed species would help the Council to assess tradeoffs in revising the exemption program in the future. Questions might include: What is the function of clam beds as habitat? What is the function of mussel beds as habitat? What about other habitat types within the HMA? Are some areas of the HMA more important as habitat than others?

We recognize that establishing clear relationships between habitats and fish production/condition has been very challenging in other areas, so this is expected to be the most difficult objective to address successfully. This is in part because fish distribution changes seasonally and year class strengths are variable, such that measuring fish distribution and abundance has challenges not associated with mapping of abiotic habitat features and attached organisms.

### ***Management Applications***

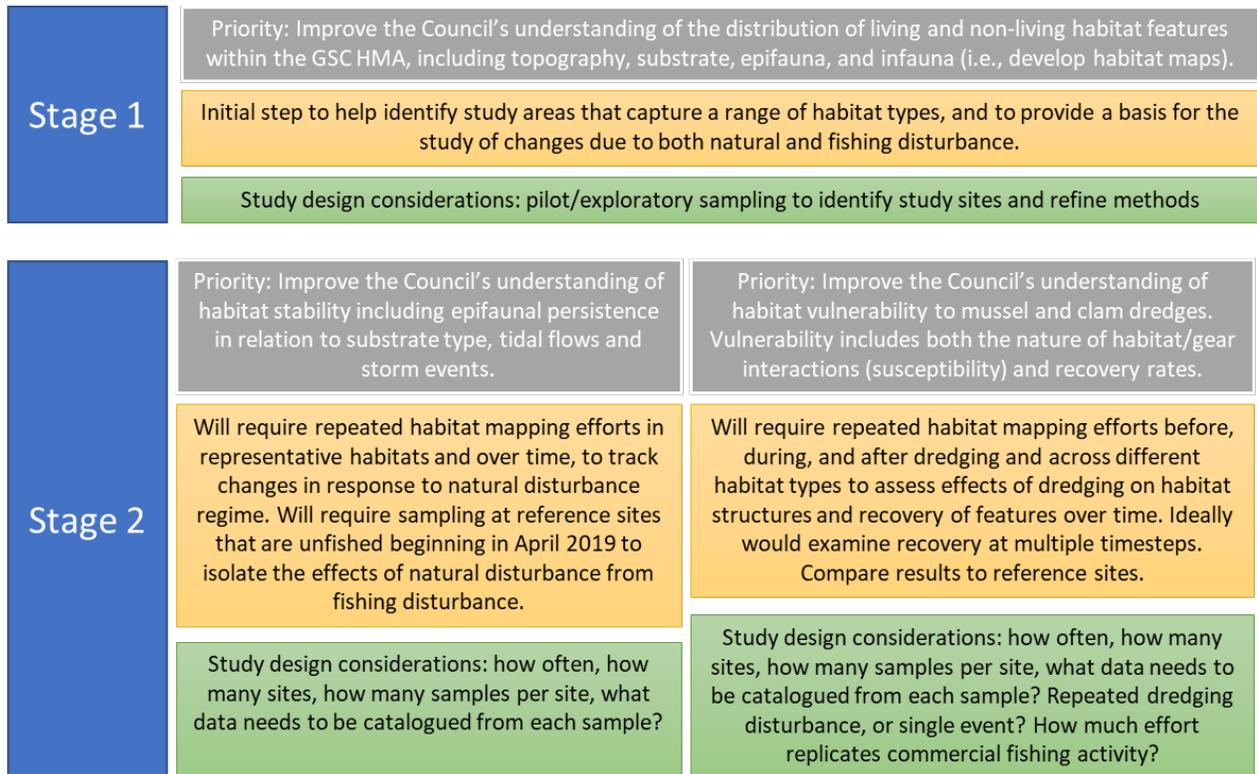
There are two major overarching questions associated with the research program. The first and more narrowly focused question is can clam or mussel dredging be conducted in the GSC HMA in a manner compatible with habitat protection objectives? This question is central to the future adaptive management of the exemption area program and was articulated by the Council during final approval of the framework in December 2018. The second, broader question is whether the GSC HMA is functioning as intended. What functions (direct and indirect) is the HMA providing to managed species and the fisheries that target those species? Are the gear restrictions associated with the HMA working effectively to maintain or improve habitat structure and function? This second question goes beyond the research framework that is described in objectives 1-3, which specifically address the more urgent management questions the Council will need to consider in evaluating the feasibility of additional exemption areas in the HMA.

Additional information collected pursuant to objective #4 should support long term evaluation of the Council’s spatial habitat management program.

***A progressive research framework***

As a practical matter there are limited resources to conduct these studies, which requires a strategic and coordinated approach that builds on itself over time. The PDT suggests initial habitat mapping as a first stage, with experiments to assess the effects of natural and gear disturbance as a second stage (Figure 1).

**Figure 1. Research framework**



***Research permits and authorizations***

Some types of habitat research require permits or authorizations. Descriptions of these are provided below. This information is from the GARFO website (see <https://www.greateratlantic.fisheries.noaa.gov/sustainable/research/permits.pdf>).

## *Research Permits*

Undertaking scientific research on regulated fisheries may require special permits, as required by experimental fishing regulations established under the Magnuson Stevens Fishery Conservation and Management Act (Magnuson Act). The Magnuson Act also includes scientific research provisions that enable NOAA Fisheries to acknowledge, through a Letter of Acknowledgment, certain activities that are not subject to Greater Atlantic Region fishery regulations.

There are three main permit types for exemption from Greater Atlantic Region fishery regulations, and an acknowledgement letter that may be applicable to scientific research being conducted:

- Exempted Fishing Permit (EFP),
- Temporary Possession Letter of Authorization,
- Exempted Educational Activity Authorization (EEAA), and
- Letter of Acknowledgment (LOA).

An EFP is a permit that authorizes a fishing vessel of the United States to conduct fishing activities that would be otherwise prohibited under the current fishing Generally, EFPs are issued for activities in support of fisheries-related research, including seafood product development and/or market research, compensation fishing, and the collection of fish for public display. Anyone that intends to engage in an activity that does not meet the definition of scientific research but that would be otherwise prohibited under these regulations is required to obtain an EFP prior to commencing the activity.

A Temporary Possession Permit authorizes a federally permitted fishing vessel that is accompanied by an eligible research technician to temporarily retain fish that are not compliant with applicable fishing regulations for the purpose of collecting catch data. Example regulations include minimum fish sizes, species under quota closures, and fish possession limits. All non-compliant fish are returned to the sea as soon as practicable following data collection.

An EEAA is a permit issued by the Regional Office to accredited educational institutions that authorize, for educational purposes, the target or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited.

A LOA is a letter from the Regional Office that acknowledges certain activities as scientific research conducted from a scientific research vessel. Scientific research activities are activities that would meet the definition of fishing under the Magnuson-Stevens Act, but for the statutory exemption provided for scientific research. Such activities are exempt from any and all regulations promulgated under the Magnuson-Stevens Act, provided they continue to meet the definition of scientific research activities conducted from a scientific research vessel. Although the LOA is not required for scientific research, obtaining a LOA serves as a convenience and may prevent work interruptions resulting from enforcement inquiries.

Point of Contact: Ryan Silva, Greater Atlantic Region - Sustainable Fisheries Division,  
[ryan.silva@noaa.gov](mailto:ryan.silva@noaa.gov), 978-281-9326.

## ***References***

- Borg, A., L. Pihl and H. Wennhage (1997). "Habitat choice by juvenile cod (*Gadus morhua* L.) on sandy soft bottoms with different vegetation types." Helgol. Meeresunters **51**(2): 197-212.
- Caddy, J. F. (2008). "The Importance of Cover in the Life Histories of Demersal and Benthic Marine Resources: A Neglected Issue in Fisheries Assessment and Management." Bulletin of Marine Science **83**(1): 7-52.
- Caddy, J. F. (2013). "Why do assessments of demersal stocks largely ignore habitat?" ICES J. Mar. Sci.
- Gotceitas, V., S. Fraser and J. A. Brown (1997). "Use of eelgrass beds (*Zostera marina*) by juvenile Atlantic cod (*Gadus morhua*)." Canadian Journal of Fisheries and Aquatic Sciences **54**(6): 1306-1319.
- Lindholm, J. B., P. J. Auster and L. S. Kaufman (1999). "Habitat-mediated survivorship of juvenile (0-year) Atlantic cod *Gadus morhua*." Mar. Ecol. Prog. Ser. **180**: 247-255.
- Linehan, J. E., R. S. Gregory and D. C. Schneider (2001). "Predation risk of age-0 cod (*Gadus*) relative to depth and substrate in coastal waters." Journal of Experimental Marine Biology and Ecology **263**(1): 25-44.
- NEFMC (2011). The Swept Area Seabed Impact Approach: a tool for analyzing the effects of fishing on Essential Fish Habitat. Available at <https://www.nefmc.org/library/omnibus-habitat-amendment-2>. 257pp.
- NEFMC (2016). Omnibus Essential Fish Habitat Amendment 2 including a Final Environmental Impact Statement. Available at <https://www.nefmc.org/library/omnibus-habitat-amendment-2>.
- Tupper, M. and R. G. Boutilier (1995). "Effects of habitat on settlement, growth, and postsettlement survival of Atlantic cod (*Gadus morhua*)." Can. J. Fish. Aquat. Sci. **52**(9): 1834-1841.