

## Five Year Research Priorities

Under the MSA, the Council must establish research priorities for five year periods, to be updated as necessary and to be submitted to the Secretary and the NMFS science centers for their consideration in developing research priorities and budgets. Although the Council sets RSA priorities and comments on NMFS, S-K proposals periodically and other research topics and proposals on an ad-hoc basis, the Council last set five-year research priorities in 2010. As a result staff is updating the priorities in the next few months before the beginning of the next round of specifications or framework adjustments in 2017.

When considering these priorities keep in mind that the scope of the five-year priorities is likely to be broader than just the RSA, collaborative research or other research needs identified in recent Council documents. For example, there might be important research needs identified in recent assessment or other documents. A copy of scallop related research priorities identified for 2010-2014 is attached and the most recent Scallop RSA announcement is attached as well for reference.



New England Fishery Management Council

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## **New England Fishery Management Council Research Priorities and Data Needs 2010-2014**

The research priorities listed below were derived from recent fishery management plan documents, reviewed and in some cases updated by the Council's Plan Development Teams (PDTs) as well as Council staff. The Scientific and Statistical Committee reviewed the list approved by the Council in 2009, made very few deletions and a number of additions where appropriate. The list is not prioritized except where noted.

A number of the items could have been categorized under several headings, but were not repeated unless there was a specific need to do so (for example, if a synthesis of several items is identified in addition to the separate components). Other recommendations could involve an expansion of current data collection efforts and stock monitoring, but also may be addressed by a re-examination of current activities including such efforts the study fleet or electronic logbook initiatives. Some investigations could be addressed through the collaborative efforts of scientists and fishermen. The Council has long recognized the benefits and value of cooperative research, has fully supported the Northeast Fisheries Science Center's initiatives in these areas and continues to support the agency's Cooperative Research Program specifically.

With respect to habitat and ecosystem research, the items below address current and perhaps the most obvious information gaps. The Council will likely expand this list once a synthesis of currently available information is developed. Studies on broader species relationships, understanding the impacts of land-based activities as well as the range of offshore energy-related development activities, mapping for a baseline understanding of fish habitats, understanding the effects of climate change and a host of other issues will emerge and should be taken into consideration in the future.

## I. Fisheries

### A. Stock Assessments

#### 1. Spatial-temporal distributions

Further investigations into stock definition, stock movements, mixing, and migration through tagging studies, DNA markers, morphological characteristics and other means for **groundfish, monkfish, skates, herring, and silver hake**.

#### 2. Biology

Life history work focusing on: (a) age and growth, (b) longevity, (c) reproduction, and (d) natural mortality of **monkfish**; recruitment processes (reproduction, larval and early post-settlement stages), growth, **natural mortality (including predation and disease) of scallops**; age, growth, maturity, and fecundity of managed **skate species**; extensive investigation concerning the biology of **red crab**, including growth rates, molt, reproductive cycles, maturity schedule, fecundity, and particularly the reproductive consequences of depleting large males. Examine red crab sex ratios by depth and year, information on larval supply, transport, settlement and early juvenile distributions and abundance. Investigate bathymetric demography of population of **silver hake**, including changes in seasonal distribution caused by environmental forcing to help with stock identification.

#### 3. Other

Investigate/determine the cause for retrospective patterns in New England **multispecies groundfish and herring assessments**, and identify appropriate adjustments (e.g., data or modeling revisions for both) to resolve those patterns.

### B. Surveys

**Conduct intensive industry-based surveys of each of the five sea scallop access areas (Closed Area I, Closed Area II, Nantucket Lightship, Elephant Trunk and Delmarva areas) and beyond (Northern Gulf of Maine management area and Southern New England)**. Research new advanced scallop and multipurpose survey technologies (video, sonar, towed, AUV, etc.) and protocols that should be compatible with and complement the existing scallop resource surveys. Conduct peer-review and inter-survey calibrations of new and existing scallop surveys. Conduct deepwater (> 200 m) surveys and efficiency estimation of NMFS survey gear for **monkfish**. Continue development of hydroacoustic surveys and other resource surveys of **pelagic species** to provide an independent means of estimating stock sizes and/or defining localized depletion (long-term research).

### C. Fishery Performance and Monitoring

Improve sampling of commercial catch at age data, such as through cooperative NMFS/industry programs to supplement port agent activities for **groundfish** and similarly for **Atlantic herring**, with an emphasis on bycatch.

Develop programs to collect information required for social and economic impact as well as cost benefit analyses for **groundfish**.

Conduct research on the extent and composition of discards and bycatch in the **monkfish, groundfish** (including small-mesh) and **skate** fisheries.

Investigate discard mortality rates by gear for **monkfish** and **groundfish**, and by gear type, area, season, depth and bottom type for **all seven skate species** with an emphasis on overfished species (thorny and smooth skates).

Define localized depletion of spawning components on a spatial and temporal scale for **herring**.

Investigate fleet behavior and decision-making with respect to their relationship to population dynamics, closed areas, catch rates, etc.

Develop methods to improve reporting compliance, including accurate reporting of species and area fished. This includes proper identification of key species, which are often mis-reported by fishermen (e.g. skates and whiting (red/white; silver/offshore). Improve procedures to reduce aggregate trip reporting by coastal states, so that more catches are reported by an identified vessel at an identified dealer, whether or not they have a federal permit, when they land a federally-regulated species (reportedly) captured in state waters.

#### **D. Fisheries Management**

##### **Groundfish**

Synthesize the available information/research results to improve utility to managers (in particular related to the following items):

Undertake comparative studies on the impacts (positive and negative) of gear on habitat, such as the different impacts between chain nets, roller gear and rockhopper gear, etc. Conduct studies on whether limiting roller or rockhopper gear, or specifying other aspects of trawl gear, results in areas of complex habitat that are not used by trawl fishermen.

1. Conduct research on the extent and composition of discards and bycatch in the groundfish fishery, including research to estimate discard mortality rates by gear for groundfish.
2. Develop a management strategy evaluation program (a specific approach to address scientific and management uncertainty, organizational and/or institutional programs and bodies, and sources and levels of funding).
3. Develop industry-based information collection systems to improve information used for groundfish management.
4. Quantify the impacts of closed areas, and evaluate the effectiveness of timing closures to coincide with spawning activity (e.g. Gulf of Maine rolling closures).
5. Investigate the effect of various management instruments (specifically user rights and ocean zoning) on management performance (biological, social and habitat) and enforcement.
6. Investigate the feasibility of public leasing of vessels to reduce fishing mortality for fisheries that have long-term potential to sustain the existing fleet capacity.
7. Consider management options for minimizing impacts on vulnerable marine ecosystems.
8. Evaluate effects and effectiveness of permanent closed areas.

##### **Sea Scallops**

Scallop and area management research, including but not limited to: an evaluation of ways to control predation on scallops; research to actively manage spat collection and seeding of sea scallops; social and economic impacts and consequences of closing areas to enhance productivity and improve yield of sea scallops and other species; and estimate factors affecting fishing power for each limited access vessel.

### **Skates**

Develop effective species identification methods for fishermen, dealers, and port samplers to improve data on species composition of landings and discards. This could include an inexpensive biochemical/genetic assay method, better training and better morphological keys for juvenile skates and skate wings.

## **II. Fisheries Interactions**

### **Bycatch**

Research fishing practices or gear modifications that may change the ratio of component catch species or improve size and species selectivity of gear in groundfish, scallop, monkfish, herring and skates.

Collect data on discards of other clupeids in the sea herring and other fisheries.

### **Expanded Ecosystem Studies**

Synthesize predator/prey information on **herring and other forage fishes** and conduct investigations to address information gaps; investigate the role of **herring and other forage fishes** in the Northwest Atlantic ecosystem and the importance of **herring and other species** as a forage for other commercial fish stocks; assess the importance of herring as forage relative to other forage species in the region.

Provide information for use in marine spatial planning.

Investigate relationships between stocks, including predator/prey relationships and evaluate whether stock status of some species is slowing the rebuilding of **groundfish** stocks.

Conduct research concerning trophic interactions of **monkfish** and monkfish cannibalism on other species; recognize the need to incorporate monkfish into prey assessments.

Investigate the influence of physical factors (including environmental changes) on shifts in the range and distribution of species within the **skate** complex.

Examine trophic interactions between **skate** species and other bottom species that occupy the same habitats.

Monitor trends in non-target, ecosystem components

Investigate effectiveness and economic impacts of closed areas and special access areas to achieve desired goals, including bycatch avoidance/reduction, mortality reduction, yield benefits, and ecosystem improvement.

### **Endangered, Threatened and Protected Species**

Develop gear modifications or fishing techniques that may be used to reduce or eliminate the threat of sea turtle interactions without unacceptable reductions in target retention in **all fisheries**.

Identify "hot spots" within the scallop fishery through data available on the observed take of sea turtles and other suitable information (*i.e.*, data on observed turtle interactions for other fisheries or fishery surveys in the area where the scallop fishery operates).

Continue and update studies on turtle behavior with respect to how sea turtle interactions with scallop dredge gear are occurring.

Investigate protected species bycatch/discards in the **directed herring fishery**.

### **III. Habitat**

Research resulting in spatial databases designed for analyses of managed species, geological, biological, and physical habitat relationships. Ideally, these data will contain absolute species abundances and concurrently sampled habitat features and substrates. The resulting data products should contain explicit statements regarding the limitations of the data for EFH analyses given the original sampling design and spatio-temporal sampling scale(s). Particular areas of interest include:

- a. Geological and biological sampling of the Gulf of Maine region .
- b. Broad-scale infaunal sampling and benthic community structure analyses (*i.e.* an update to the Theroux and Wigley dataset).
- c. Ground-truthing via physical sampling of benthic fauna observed in video and still imagery-based datasets.

Experimental examination of gear impacts on seabed habitats in Northeast US waters. Sampling should follow an appropriate experimental design, such as before-after control impact (BACI).

Particular areas of interest include:

- a. Studies that would inform assessments of the effects of fixed gears on seabed habitat components. In particular, the extent of fixed gear movement along the seabed during setting, soaking, and hauling is not known.
- b. Comparative studies of the effects of various trawl gear configurations on seabed habitat components. These studies would inform estimates of the possible benefits of gear restrictions/modifications. Also, evaluate whether gear restrictions actually result in changes in the distribution of fishing effort by habitat type. In order to model the effects of these changes, data would need to be collected on when, where, and under what conditions particular gear configurations are employed.
- c. Studies that help to quantify the degree of seabed contact for particular gears and their component parts.

Link habitat types and their specific functions with fishery resource productivity. This information could be used to refine EFH designations, to understand the relative benefits of EFH impact minimization alternatives and possibly to inform reference point definitions.

Collect additional data on the locations of deep-sea corals on/adjacent to the Northeast US continental shelf. Broad-scale observations of previously unsurveyed areas would refine understanding of the total area of seabed covered by these species – much of the current data was collected on a fine scale and there are many gaps in coverage.

Refine estimates of critical shear stress at the seabed/water column interface. Where possible, use data from sensors deployed on the seabed to groundtruth modeled estimates.

Conduct studies on invasive species/organisms to understand dispersal, and impacts on habitat, species, etc.

Explore trade-offs between habitat protection within closed or restricted areas and shifts in effort to open areas; impacts of implicit or explicit outcomes should be ground-truthed.

#### FMP-Specific Habitat Research

##### **Groundfish**

Undertake comparative studies on the impacts (positive and negative) of gear on habitat, such as the different impacts between chain nets, roller gear, and rockhopper gear, etc.

##### **Sea Scallops**

Identify and evaluate methods to reduce habitat impacts, including, but not limited to: broader investigations of variability in scallop dredge efficiency across habitats, times, areas, and gear designs; and research on habitat effects from scallop fishing and the development of practicable methods to minimize or mitigate those impacts.

Habitat characterization research including, but not limited to: video and/or photo transects of the bottom within scallop access areas and within closed scallop areas and in comparable fished areas that are both subject and not subject to scallop fishing before and after scallop fishing commences; develop high resolution sediment mapping of scallop fishing areas possibly using the Canadian sea scallop industry mapping efforts as a model; identify nursery and over-wintering habitats of species that are vulnerable to habitat alteration by scallop fishing; and other research that relates to habitats affected by scallop fishing, including, but not limited to, long-term or chronic effects of scallop fishing on marine resource productivity, other ecosystem effects, habitat recovery potential and fine scale fishing effort in relation to fine scale habitat distribution -- in particular, projects that directly support evaluation of present and candidate EFH closures and HAPCs to assess whether these areas are accomplishing their stated purposes and to assist in better defining the complex ecosystem processes that occur in these areas.

**Commented [DVB1]:** I notice that this last element is not in the updated language. Does PDT agree this would be valuable to still include? Likely an oversight.

#### **(Draft input from EFH PDT)**

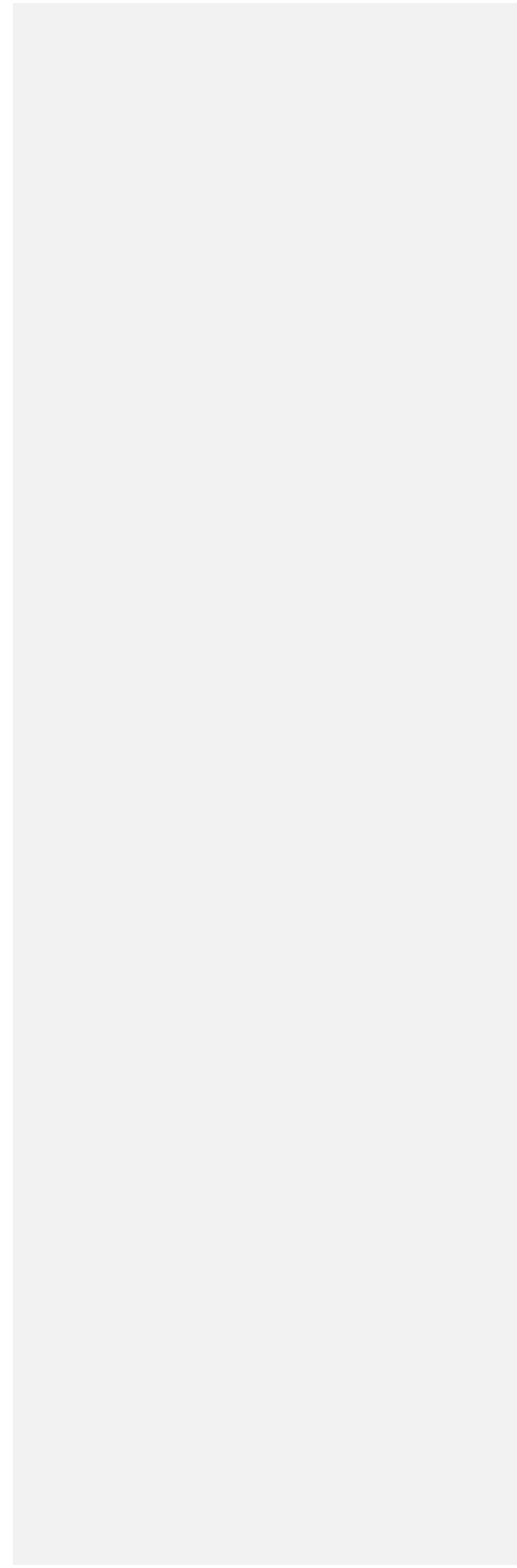
1. Characterize habitats within scallop fishing grounds, including:
  - a. Video and/or photo transects of the seafloor before and after scallop fishing commences,
  - b. Identification of nursery and over-wintering habitats of species that are vulnerable to habitat alteration by scallop fishing,
  - c. Studies that evaluate habitat recovery following impact with scallop dredges or trawls, and
  - d. Studies that examine fine scale fishing effort distributions in relation to fine scale habitat distribution.
2. Evaluate the long-term or chronic effects of scallop fishing on marine resource productivity.
3. Identify and evaluate methods to reduce the habitat impacts of scallop fishing, including studies that evaluate variability in scallop dredge efficiency across habitats, times, areas, and gear designs.

**Monkfish**

Conduct tagging and telemetry studies focusing on basic life history as well as habitat use.

**IV. Areas of Research for all Fishery Management Plans**

Initiate or expand appropriate programs to collect information required for improved social and economic impact analyses. This has been identified as a pressing need for every NEFMC fishery management plan.





## 2016 and 2017 Scallop RSA priorities

### HIGHEST (listed in order of importance)

#### 1. Survey Related Research (a, b, and c have equal priority)

- 1a. an intensive industry-based survey of each of the relevant scallop access areas (Closed Area I, Closed Area II, Nantucket Lightship, Delmarva, Elephant Trunk and Hudson Canyon) that will provide estimates of total and exploitable biomass to be used for setting fishery catch limits under the rotational area management program. To support these area management decisions, survey data and biomass estimates must be available by early August of the year in which the survey is conducted (e.g. survey results that would inform 2017 fishing area decisions must be available by August 2016). Areas scheduled to be open in the following fishing year generally have a higher priority than other areas. For 2016 the priority areas are likely to be: Elephant Trunk, Hudson Canyon, the access area in southern part of Closed Area II, the access area in Nantucket Lightship including the extension to the east as well as to the west within the current EFH closed area where small scallops have been observed, and to the north of the Closed Area I access area within the current EFH closed area that has known concentrations of scallops. For 2017 the priority areas are: Elephant Trunk, the access area in the southern part of Closed Area II, and the access area in Nantucket Lightship with extension to the east. If boundaries of scallop access areas change as a result of a future Council action, then applicants may be requested to adjust their survey to be consistent with new or modified access area boundaries. Additionally, applicants should note that the priority areas listed here may change based on results of 2015 surveys and/or feedback from the scallop fishing industry. Therefore, applicants may be requested to adjust their proposed survey to meet these emergent survey needs.
- 1b. an intensive industry-based survey of areas that may be candidate access areas in the future (i.e., open areas with high scallop recruitment or closed areas that may open to fishing). Examples areas include the Northern Edge of Georges Bank in and around Closed Area II, the northern part of Closed Area I that is currently part of an essential fish habitat (EFH) closed area, east and west of the Nantucket Lightship scallop Access Area, south of Closed Area II, and south of Nantucket Lightship along the 40 fathom curve to Hudson Canyon. Seasonal monitoring of candidate access areas will be considered to monitor the survival of small scallops.
- 1c. a broad, resource wide industry-based survey of scallops within Georges Bank and/or Mid-Atlantic resource areas. The survey or surveys do not need to be carried out by a single grant recipient. The primary objective of these surveys would be to provide an additional broadscale biomass index to improve the overall precision of the scallop biomass estimate produced by the Scallop Plan Development Team. Survey results must be available by early August of the year in which the survey is conducted (e.g. survey results that would inform 2017 fishing effort decisions must be available by early August 2016).

#### 2. Bycatch research

- Identification and evaluation of methods to reduce the impacts of the scallop fishery with respect to bycatch. This would include projects that determine seasonal bycatch rates, characterize spatial and temporal distribution patterns, gear modifications to reduce bycatch

and avoid fishery conflicts, as well as the associated discard mortality rates of yellowtail flounder, windowpane flounder, lobster, and other key bycatch species. Research efforts should be targeted to provide results that would help the scallop industry avoid pending or potential implementation of accountability measures.

3. Scallop area management research

- Such research would include, but would not be limited to, research to actively manage spat collection and seeding of sea scallops; and research aimed at describing the occurrence, as well as understanding the mechanisms, of processes that affect scallop product quality (i.e., scallops with grey meats or evidence of disease/parasites).

**MEDIUM (not listed in order of importance):**

4. Research on scallop predation and ways to mitigate predation impacts (e.g. starfish, crab and dogfish)

5. Research to support the investigation of loggerhead turtle behavior in the Mid-Atlantic (via satellite tagging or other means) to understand their seasonal movements, vertical habitat utilization, and how and where interactions with scallop dredge gear are occurring. This includes monitoring of scallop dredge and scallop trawl operations, and the development of further gear modifications if monitoring should indicate current designs are not eliminating the threat or harm to sea turtles or are resulting in unacceptable reductions in scallop catch.

**OTHER (not listed in order of importance):**

6. Habitat characterization research including (but not limited to): before after control impact (BACI) dredge studies; identification of nursery and over-wintering habitats of species that are vulnerable to habitat alteration by scallop fishing; evaluation of long-term or chronic effects of scallop fishing on the ecosystem; and habitat recovery potential from fine scale fishing effort. In particular, projects that would evaluate present and candidate EFH closures to assess whether these areas are accomplishing their stated purposes and to assist better definition of the complex ecosystem processes that occur in these areas. Finally, investigation of variability in dredging efficiency across habitats, times, areas, and gear designs to allow for more accurate quantitative estimates of scallop dredge impacts on the seabed and development of practicable methods to minimize or mitigate those impacts.

7. Research projects designed to either

- examine whether chemicals, water quality, and other environmental stressors affect reproduction and growth of scallops (e.g. jet fuel, pesticides, ocean acidification, etc.); or
- research other scallop biology projects, including studies aimed at understanding recruitment processes (reproduction, timing of spawning, larval and early post-settlement stages), and seasonal growth patterns of scallop shell height and meat and gonad weight (which could include analysis of Northeast Fisheries Science Center archived scallop shells from the 1980s and 1990s).

8. Discard mortality of scallops. The assumed discard mortality rate used in the scallop stock assessment is very uncertain. Research that would improve the understandings of discard mortality and refine the assumed discard mortality rate would be useful, especially if projects are able to assess variability due to habitat, season, and gears, as well as the magnitude scallops discarded at sea and not landed due to scallop meat quality issues.

9. Incidental mortality of scallops. The assumed incidental mortality rate used in the scallop stock assessment is very uncertain. Research that would evaluate the effect of the four inch rings and mesh twine tops on incidental mortality would be useful.

10. Other resource surveys to expand and/or enhance survey coverage in areas that have the potential to be important resource areas, but which currently lack comprehensive survey coverage (e.g. inshore areas east of the current NOAA Fisheries survey strata or deeper than the surveyed area, Northern Gulf of Maine resource, etc.).

11. Develop methodologies or alternative ways for the scallop fleet to collect and analyze catch and bycatch data on a near real-time basis (i.e., collection of scallop meat weight and quality data, specific bycatch information, etc. Potential ideas include, but are not limited to: concepts like a scallop "Study Fleet", electronic monitoring, dockside monitors, scallop bag tags, etc.)

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The following motion was made during the scallop RSA discussion at the June 2015 Council meeting, for the groundfish PDT and Committee's consideration when discussion the multi-year research priorities need.

- *Ms. Tooley moved and Mr. Terry Alexander seconded: that the Council forward the other research priorities identified by the Scallop Committee to the Research Steering and Groundfish committee that are not specific to the scallop RSA program. These items should be forwarded for future consideration in overall research priorities. Other research priorities include: 1) assess where juvenile cod hot spots are; 2) dedicated survey of windowpane flounder to improve assessment; 3) identify winter flounder spawning areas; and 4) use commercial vessels to collect basic oceanographic data (temp, salinity, ph, etc.) . The motion carried unanimously on a show of hands (16/0/0).*