FINAL

Omnibus Essential Fish Habitat Amendment 2

Volume 2:
EFH and HAPC Designation Alternatives and Environmental Impacts

Amendment 14 to the Northeast Multispecies FMP
Amendment 14 to the Atlantic Sea Scallop FMP
Amendment 4 to the Monkfish FMP
Amendment 3 to the Atlantic Herring FMP
Amendment 2 to the Red Crab FMP Amendment 2 to the Skate FMP Amendment 3 to the Atlantic Salmon FMP

Including a
Final Environmental Impact Statement

Prepared by the
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National Marine Fisheries Service

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2.2 Preferred EFH Designations

2.2.1 Northeast multispecies (groundfish) – large mesh species

2.2.1.1 Acadian redfish

There is no egg designation for redfish because the species is ovoviviparous, meaning that live young hatch from eggs brooded internally. Because the distribution of larval survey data for redfish larvae is very "patchy," the trawl survey data for juveniles were used in combination with the larval MARMAP[9] data to map EFH for larval redfish.[10] The proposed EFH map for redfish larvae is based on the distribution of depths and bottom temperatures that are associated with high catch rates of juveniles in the 1963-2003 spring and fall NMFS trawl surveys. It is also based on average juvenile catch per tow data in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level, and includes inshore and continental slope areas where juvenile redfish were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys, and the maximum depth and geographic range where they were determined to be present on the slope. All of the ten minute squares where larval redfish were collected during the MARMAP surveys were added to the proposed larval EFH map. The proposed adult redfish EFH map was created using the same methods and data sources that were used to map juvenile EFH, but using data specific to adults.

The no action EFH maps for juvenile and adult redfish are the same and define EFH to be nearly the entire Gulf of Maine and deep water on the southern edge of Georges Bank.[11] The proposed new juvenile EFH map only extends as deep as 200 meters in the Gulf and, therefore, excludes the deep basins. The new adult map highlights the outer Gulf of Maine and excludes areas surveyed by the NMFS that are shallower than 140 meters. Both maps would extend EFH onto the continental slope as far south as the reported range of the species off Virginia (37˚38'N). The proposed juvenile map also includes nearshore waters in the Gulf of Maine that were not explicitly included in the no action designation, but excludes some areas in the southwestern Gulf of Maine and on western Georges Bank that were designated originally.

The proposed text descriptions define more restricted depth ranges for juvenile and adult redfish EFH than the no action designations, to 200 meters as opposed to 25-400 meters for juveniles, and 140-300 meters instead of 50-350 meters for adults, and add the upper continental slope down to 600 m for both life stages. The proposed new text description for juveniles also includes substrate information that is specific to young-of-the-year juveniles, while the proposed adult text description includes common attached epifauna (anemones, sponges, and corals) that provide shelter.

The proposed larval map, as modified, differs substantially from the map that was originally approved for the DEIS in 2007. There are now two separate maps for larval and juvenile redfish and, with the addition of the larval survey data that were left out of the original map, larval EFH now extends on to southern Georges Bank. The approved larval and juvenile EFH map now applies only to the juveniles, and was not otherwise modified. The modified adult EFH map covers a larger portion of the outer Gulf of Maine than the original approved map owing to an increase in the maximum depth from 200 to 300 meters.

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[9] The Northeast Fisheries Science Center's Marine Resources Monitoring, Assessment, and Prediction (MARMAP) Program sampled fish eggs and larvae on monthly to bimonthly surveys from Cape Hatteras, North Carolina to Cape Sable, Nova Scotia from 1977 through 1987.
[10] The Council approved a larval and juvenile EFH map in 2007 that only used juvenile trawl survey data, without the larval data; this map failed to include the southern portion of Georges Bank where redfish larvae were collected during the MARMAP surveys.
[11] The adult distribution (100%) was used to map EFH for adults and juveniles in the status quo EFH designations.

Note that the Alternative 1/No Action designation includes two species, *Sebastes faciatus* and *S. mentella*, while the alternative designations include *S. faciatus* only. This is because *S. mentella* are rare, and their distribution is generally restricted to deeper waters on the shelf edge.

***Text descriptions**:*

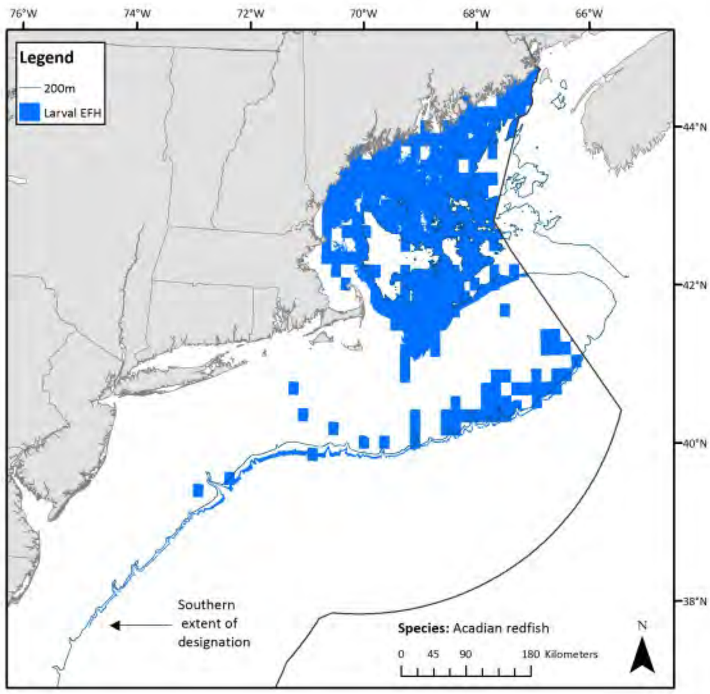
Essential fish habitat for redfish (*Sebastes fasciatus*) is designated anywhere within the geographic areas that are shown on the following maps and meets the conditions described below.

Larvae: Pelagic habitats in the Gulf of Maine, on the southern portion of Georges Bank, and on the continental slope north of 37°38'N latitude, as shown on Map 31.

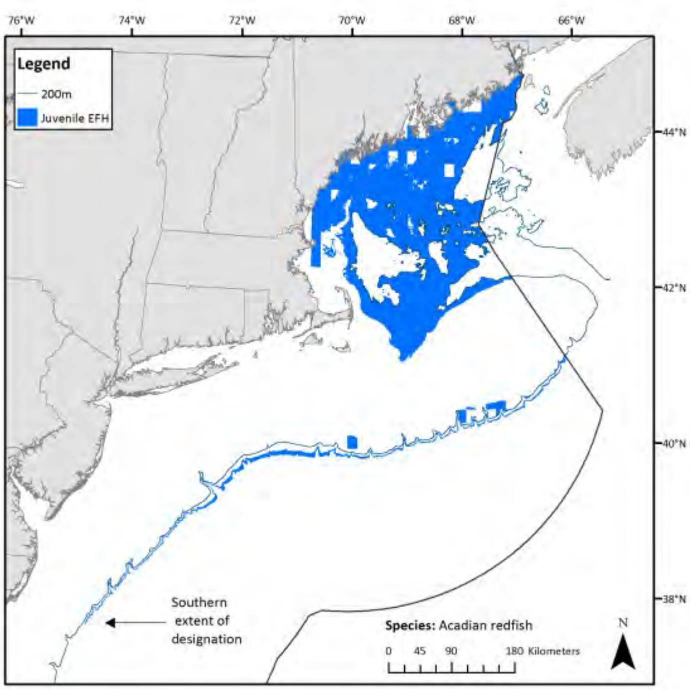
Juveniles: Sub-tidal coastal and offshore benthic habitats in the Gulf of Maine between 50 and 200 meters, and on the continental slope to a maximum depth of 600 meters north of 37°38'N latitude (see Map 32). Bottom habitats of complex rocky reef substrates with associated structure-forming epifauna (e.g., sponges, corals), and soft sediments with cerianthid anemones are essential fish habitat for juvenile redfish. Young-of-the-year juveniles are found on boulder reefs, while older juveniles are found in dense cerianthid habitats. Juvenile redfish expand their distribution to adjacent gravel habitats when local abundance on reefs is high. They do not use unstructured mud habitat. Areas of hard bottom in the deep basins are also good habitat for juveniles.

Adults: Offshore benthic habitats in the Gulf of Maine, primarily in depths between 140 and 300 meters, and on the continental slope to a maximum depth of 600 meters north of 37°38'N latitude (see Map 33). Essential fish habitat for adult redfish occurs on finer grained bottom sediments and variable deposits of clays, silts, gravel, and boulders with associated structure-forming epifauna (e.g. corals, sponges, cerianthid anemones, sea pens).

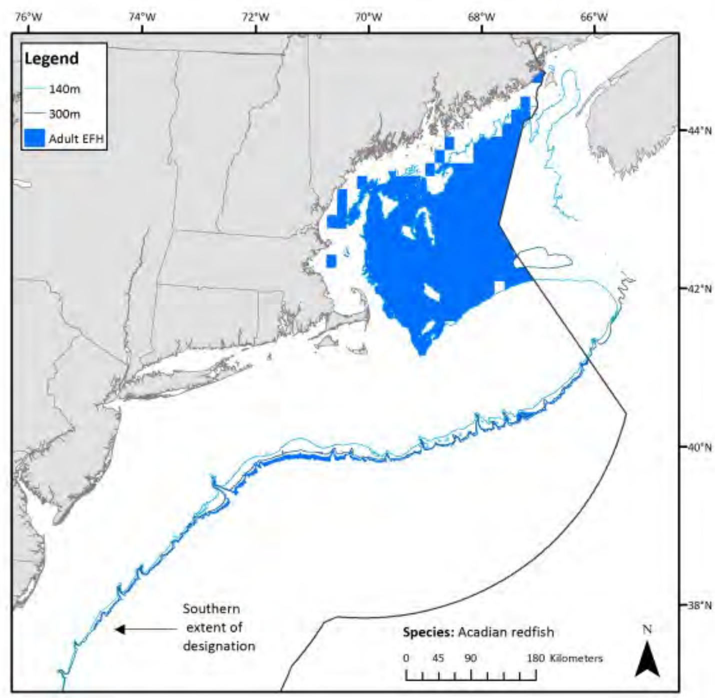
Map 31 – Acadian redfish larval EFH.



Map 32 – Acadian redfish juvenile EFH.



Map 33 – Acadian redfish adult EFH.



2.2.1.2 American plaice

As in the original EFH designations, the proposed egg and larval EFH maps are based on the 75th percentile of the observed range of the MARMAP survey data. The egg and larval EFH designations also include those bays and estuaries identified by the ELMR program as supporting American plaice eggs or larvae at the "common" or "abundant" level (see Table 18).

The proposed EFH maps for juvenile and adult American plaice within the NMFS trawl survey area were developed using a GIS depiction of preferred depth and bottom temperature ranges that were determined from graphical 1963-2003 spring and fall NMFS trawl survey data in Johnson (2005), plus average catch per tow data for each life stage in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys mapped at the 75th percentile level. They also include inshore areas where American plaice were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys, and ELMR information for coastal bays and estuaries. The 75th percentile and 10% frequency of occurrence data layers were created separately for juveniles and adults. These juvenile and adult designations were referred to as Alternative 3C in the Phase 1 DEIS.[12]

Modifications to this mapping procedure resulted in some minor changes to the juvenile American plaice map that was initially approved by the Council and is in the 2007 Phase 1 DEIS.

[12] The preferred alternative maps for juveniles and adults in the DEIS are not the right maps.

The major change in the adult EFH map was caused by a revision of the maximum depth, from 200 to 300 meters, based on re-analysis of the data. As a result, deep water in the Gulf of Maine (in particular, Wilkinson Basin) is now included in the proposed EFH designation.

Compared to the no action map, the proposed EFH map for juveniles excludes large areas in the outer Gulf of Maine that were included in the no action map and are deeper than the maximum defined depth (180 m). Because the maximum depth for the adults is 300 meters, the proposed new map for the adults, like the no action map, extends over the most of the Gulf of Maine.

The proposed EFH descriptions for juvenile and adult plaice define the preferred substrate as being mud and sand and do not include gravel, which was included in the no action descriptions.[13] They also extend EFH for into deeper water than the original, 180versus 150 meters for the juveniles and 300 versus 175 meters for the adults. At the same time, there is no defined minimum depth for either life stage. These revisions of the EFH descriptions for juvenile and adult American plaice are more consistent with the new maps than was the case for the no action designations. They were made in recognition of the fact that this species is common or abundant in a number of shallow-water bays and estuaries in the Gulf of Maine (see Table 18), but it is also true that juvenile and adult American plaice are not caught very often in bottom trawl surveys at depths below 40-60 and 40-80 meters, respectively (see Appendix B). The substrate information in the no action and the proposed new text descriptions is essentially the same.

Text descriptions:

Essential fish habitat for American plaice (*Hippoglossoides platessoides*) is designated anywhere within the geographic areas that are listed in Table 18 and shown in the following maps which exhibit the environmental conditions defined in the text descriptions. Additional habitat-related information for this species can be found in Appendix B.

Eggs: Pelagic habitats in the Gulf of Maine and on Georges Bank as shown on Map 34, including the high salinity zones of the bays and estuaries listed in Table 18.

Larvae: Pelagic habitats in the Gulf of Maine, on Georges Bank, and in southern New England, as shown on Map 35, including the high salinity zones of the bays and estuaries listed in Table 18.

Juveniles: Sub-tidal benthic habitats in the Gulf of Maine and the western portion of Georges Bank, between 40 and 180 meters (see Map 36) and including mixed and high salinity zones in the coastal bays and estuaries listed in Table 18. Essential fish habitat for juvenile American plaice consists of soft bottom substrates (mud and sand), but they are also found on gravel and sandy substrates bordering bedrock.

[13] Note that American plaice have been associated with gravel substrates on the Scotian Shelf (see Appendix B), but the Council decided to rely primarily on habitat-related information that was available for U.S. waters when developing EFH text descriptions.

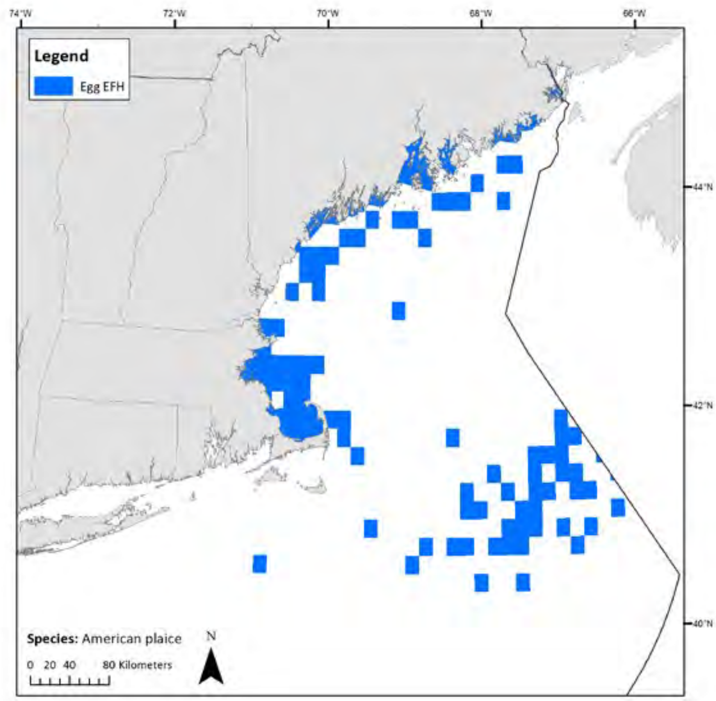
Adults: Sub-tidal benthic habitats in the Gulf of Maine and the western portion of Georges Bank, between 40 and 300 meters (see Map 37) and including high salinity zones in the coastal bays and estuaries listed in Table 18. Essential fish habitat for adult American plaice consists of soft bottom substrates (mud and sand), but they are also found on gravel and sandy substrates bordering bedrock.

Table 18 – American plaice EFH designation for estuaries and embayments.

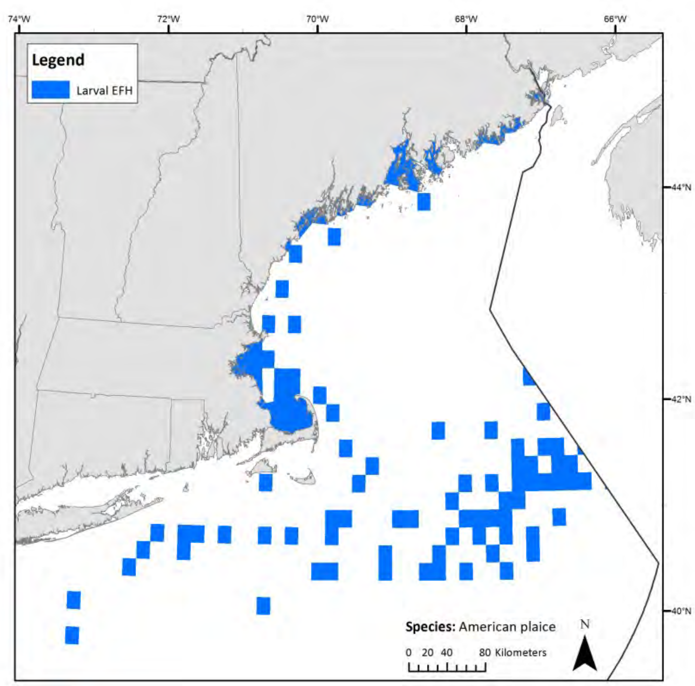
Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults
Passamaquoddy Bay	S	S	S,M	S
Englishman/Machias Bay	S	S	S,M	S
Narraguagus Bay	S	S	S,M	S
Blue Hill Bay	S	S	S,M	S
Penobscot Bay	S	S	S,M	S
Muscongus Bay	S	S	S,M	S
Damariscotta River	S	S	S,M	S
Sheepscot River	S	S	S,M	S
Kennebec / Androscoggin	S	S	S,M	S
Casco Bay	S	S	S,M	S
Saco Bay	S	S	S	S
Massachusetts Bay	S	S	S	S
Boston Harbor	S	S	S	S
Cape Cod Bay	S	S	S	S

S ≡The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).

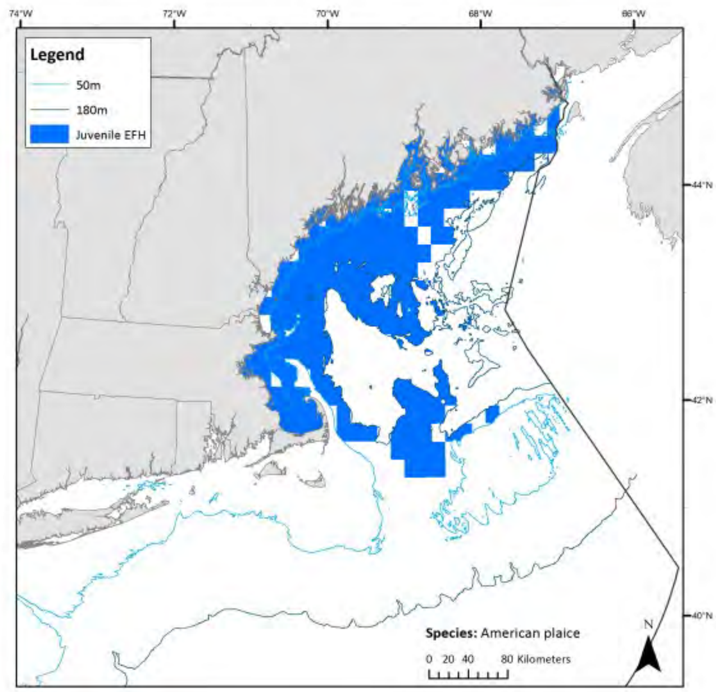
Map 34 – American plaice egg EFH.



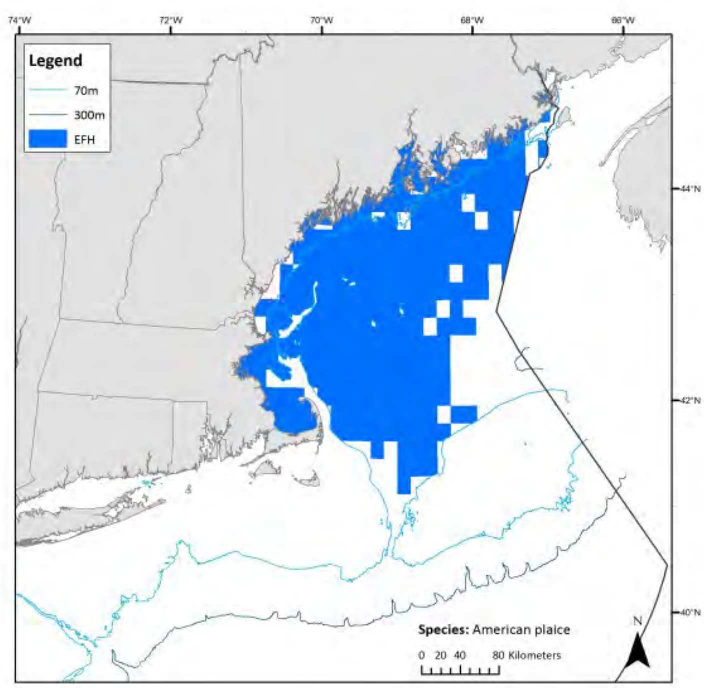
Map 35 – American plaice larval EFH.



Map 36 – American plaice juvenile EFH.



Map 37 – American plaice adult EFH.



2.2.1.3 Atlantic cod

The proposed EFH maps for Atlantic cod eggs and larvae are based on the relative abundance of juvenile cod during 1968-2005 in the fall and spring NMFS trawl surveys at the 90th percentile catch level, and the relative abundance of eggs and larvae during 1978-1987 in the NMFS MARMAP ichthyoplankton surveys at the 90th percentile area level. The proposed maps also include ten minute squares in state waters that met the 10% or more frequency of occurrence criterion for juvenile cod, those bays and estuaries identified by the ELMR program where Atlantic cod eggs or larvae were "common" or "abundant," (see Table 19). These egg and larval designations were referred to as Alternative 2E in the Phase 1 DEIS.[14] The proposed new EFH maps for Atlantic cod eggs and larvae extend further south than the no action maps, which are limited by the distribution of juvenile cod and do not include any area south of southern New England. The new maps also include Nantucket Sound and more areas along the Maine coast than were included in the original maps.

The proposed EFH maps for juvenile and adult Atlantic cod within the NMFS trawl survey area were developed using a GIS depiction of preferred depth and bottom temperature ranges that were determined from graphical 1963-2003 spring and fall NMFS trawl survey data in Lough (2005). They are also based on average catch per tow data in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys mapped at the 90th percentile of catch level and include inshore areas where juveniles or adults were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys, and ELMR information for coastal bays and estuaries. Both maps include ten minute squares along the Maine coast that were either inadequately surveyed (fewer than four tows) or were "filled in" based on input from industry members on the Habitat Committee. The adult map also includes historical cod spawning grounds in coastal Gulf of Maine waters.[15] The juvenile and adult designations were referred to as Alternative 3E in the Phase 1 DEIS.[16]

The proposed new juvenile map extends over a similar geographic area as the no action map, but only includes coastal waters in the Gulf of Maine shallower than 120 meters. Considerably more area in southern New England (e.g., Nantucket Sound) and on the southern portion of Georges Bank has been added. A few scattered ten minute squares have also been added in the Mid-Atlantic. The proposed EFH map for adult cod is also more limited to the shallower portion of the Gulf of Maine (<160 meters) than the no action map. It excludes coastal waters off New Jersey and Delaware that were added to the original maps because of their historical importance

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[14] The 2E map for cod eggs in the DEIS is not accurate: a number of ten minute squares that were not in either of the input data sets were inadvertently filled in.

[15] Ten minute squares along the Maine and New Hampshire coasts that overlap with historically important spawning grounds, as reported by Ames (2002), were added to the proposed adult EFH map; they were also added to the status quo map in 1998.

[16] In both of the maps that were approved for the DEIS in 2007 areas of historical importance that were not represented by the survey data were "filled in" by the Council's Habitat Committee. Also, the adult designation that was approved in 2007 was based on the 75th percentile of the NMFS survey data and did not include continental shelf waters in the Mid-Atlantic that are included in the new 90th percentile map that was approved by the Habitat Committee in 2011.

for adult cod that migrate (or used to) that far south in the winter. Compared with the maps in the DEIS, a few ten minute squares in the outer Gulf of Maine that do not conform to the maximum depth identified as EFH for juvenile and adult cod have been removed. The most significant change in the proposed adult map is the extension of EFH on to the southern portion of Georges Bank and westward on the continental shelf into the Mid-Atlantic region.

The proposed new text descriptions include more detailed information on the wide variety of substrates utilized by juvenile and adult cod than are in the no action descriptions. The no action descriptions refer only to cobble or gravel, for juveniles, and rocks, pebbles, or gravel for adults; the new designations also identify biogenic features of benthic habitats (e.g., submerged aquatic vegetation and attached epifauna) that are essential for recently settled young-of-the-year juvenile cod.[17] Another important component of the proposed new EFH designation for juvenile cod is a depth range that specifically includes the intertidal zone and extends into deeper water (120 meters vs. 75 meters in the no action description). As is true for the other managed species included in this amendment, the proposed new EFH text descriptions are much more consistent with the maps.

Text descriptions:

Essential fish habitat for Atlantic cod (*Gadus morhua*) is designated anywhere within the geographic areas that are shown in Table 19 and the following maps which exhibit the environmental conditions defined in the text descriptions.

Eggs: Pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, as shown on Map 38, and in the high salinity zones of the bays and estuaries listed in Table 19.

Larvae: Pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, as shown on Map 39, and in the high salinity zones of the bays and estuaries listed in Table 19.

Juveniles: Intertidal and sub-tidal benthic habitats in the Gulf of Maine, southern New England, and on Georges Bank, to a maximum depth of 120 meters (see Map 40), including high salinity zones in the bays and estuaries listed in Table 19. 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, are essential habitats for juvenile cod. In inshore waters, young-of-the-year juveniles prefer gravel and cobble habitats and eelgrass beds after settlement, but in the absence of predators also utilize adjacent un-vegetated sandy habitats for feeding. Survival rates for young-of-the-year cod are higher in more structured rocky habitats than in flat sand or eelgrass; growth rates are higher in eelgrass. Older juveniles move into deeper water and are associated with gravel, cobble, and boulder habitats, particularly those with attached organisms. Gravel is a preferred substrate for young-of-the-year juveniles on Georges Bank and they have also been observed along the small boulders and cobble margins of rocky reefs in the Gulf of Maine.

[17] The proposed juvenile cod text description is the only one that includes some level 3 information describing habitats where growth and survival are high for the young-of-the-year.

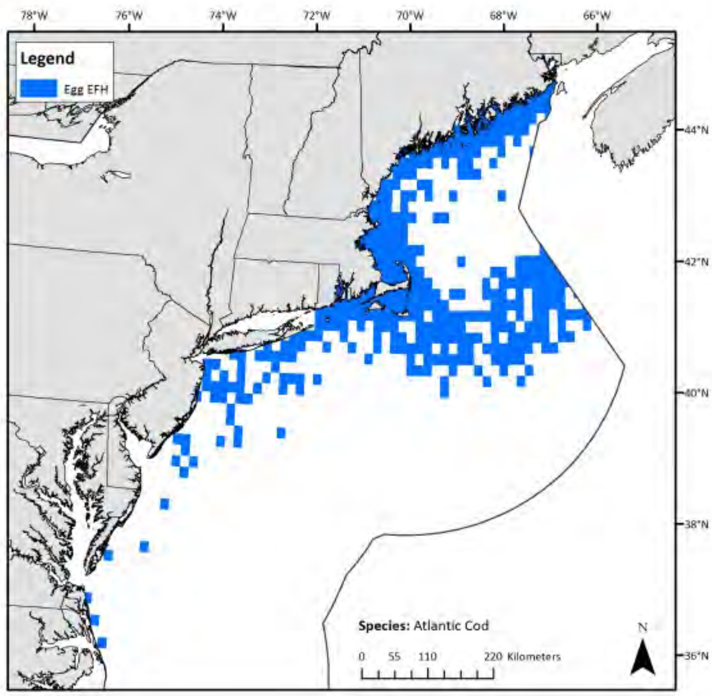
Adults: Sub-tidal benthic habitats in the Gulf of Maine, south of Cape Cod, and on Georges Bank, between 30 and 160 meters (see Map 41), including high salinity zones in the bays and estuaries listed in Table 19. Structurally complex hard bottom habitats composed of gravel, cobble, and boulder substrates with and without emergent epifauna and macroalgae are essential habitats for adult cod. Adult cod are also found on sandy substrates and frequent deeper slopes of ledges along shore. South of Cape Cod, spawning occurs in nearshore areas and on the continental shelf, usually in depths less than 70 meters.

Table 19 – Atlantic cod EFH designation for estuaries and embayments.

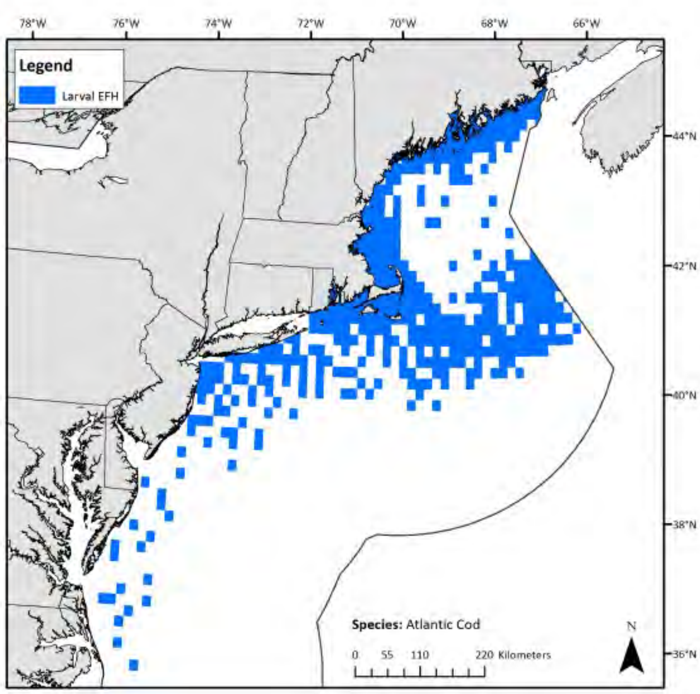
Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults
Passamaquoddy Bay		S	S	S
Englishman/Machias Bay	S	S	S	S
Narraguagus Bay	S	S	S	S
Blue Hill Bay	S	S	S	S
Penobscot Bay		S	S	S
Muscongus Bay			S	S
Damariscotta River			S	S
Sheepscot River	S	S	S	S
Kennebec / Androscoggin			S	S
Casco Bay	S	S	S	S
Saco Bay	S	S	S	S
Great Bay	S	S		
Hampton Harbor*	S	S		
Plum Island Sound*	S	S		
Massachusetts Bay	S	S	S	S
Boston Harbor	S	S	S,M	S,M
Cape Cod Bay	S	S	S	S
Buzzards Bay	S	S	S	S

S ≡The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).
** = This water body was not included in the original ELMR reports, but it was included in the salinity zone maps that were appended to all the relevant fishery management plans and amendments which implemented the no action EFH designations; EFH designations were inferred in these locations if there were ELMR-based designations in the adjacent north and south locations.*

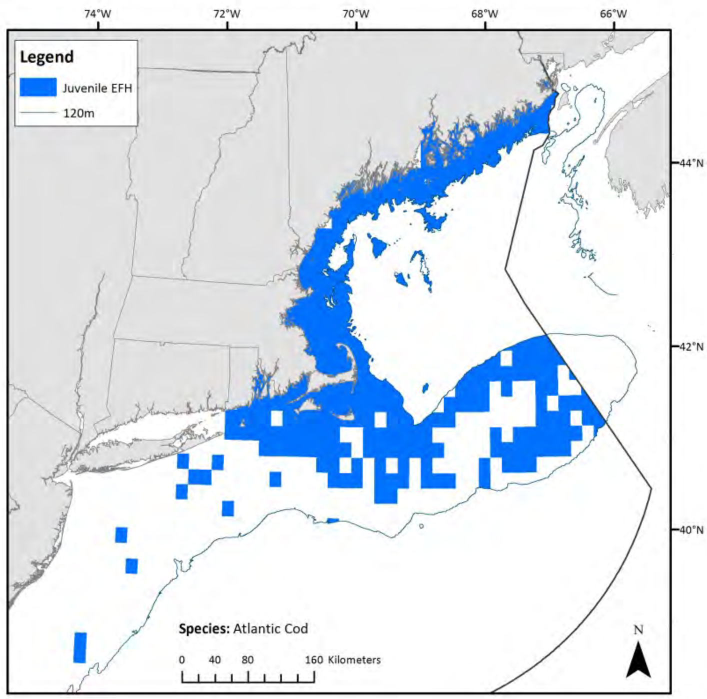
Map 38 – Atlantic cod egg EFH.



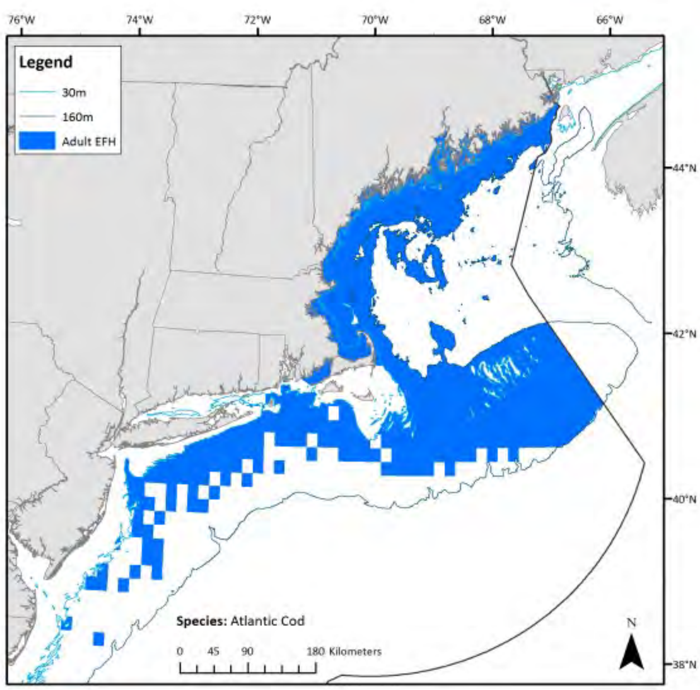
Map 39 – Atlantic cod larval EFH.



Map 40 – Atlantic cod juvenile EFH.



Map 41 – Atlantic cod adult EFH.



2.2.1.4 Atlantic halibut

The proposed EFH designation map for all four life history stages of Atlantic halibut within the NMFS trawl survey area was developed using a GIS depiction of preferred depth and bottom temperature ranges that were determined from graphical 1963-2003 spring and fall NMFS trawl survey for juveniles and adults in NEFSC (2004a). It is also based on average catch per tow data at the 90th percentile of catch level for juveniles and adults in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys, and includes a portion of the continental slope. The proposed designation map is bounded by the historic range of the species, which was determined to approximate the area east of 70˚W longitude, i.e., the Gulf of Maine and Georges Bank.

The no action EFH map for Atlantic halibut is very non-specific, covering the entire historic range of the species in the Gulf of Maine and on Georges Bank. The proposed new map extends over the same geographic area, but defines two very specific depth ranges, 60-140 m on the shelf and 400-700 m on the slope. The map that was approved for the DEIS erroneously included a large area on the continental shelf west of 70˚W longitude, the entire continental slope down to 700 meters, and a few scattered ten minute squares in the Gulf of Maine and in Georges Bank that are deeper than 140 meters. These errors have been corrected.

For juvenile halibut, the no action text describes EFH as generally occurring in a very shallow depth range (20-60 m) which is not included at all in the proposed new EFH designation for the continental shelf.[18] The depth range for the adults in the no action designation (100-700 m) is more consistent with the new depth range for both life stages, which has separate shelf and slope components (60-140 and 400-700 m). The substrates identified in the no action and the proposed text descriptions are the same. .

Text descriptions:

Essential fish habitat for Atlantic halibut (*Hippoglossus hippoglossus*) is designated anywhere within the geographic areas that are shown on Map 42 which exhibit the environmental conditions defined in the text descriptions.

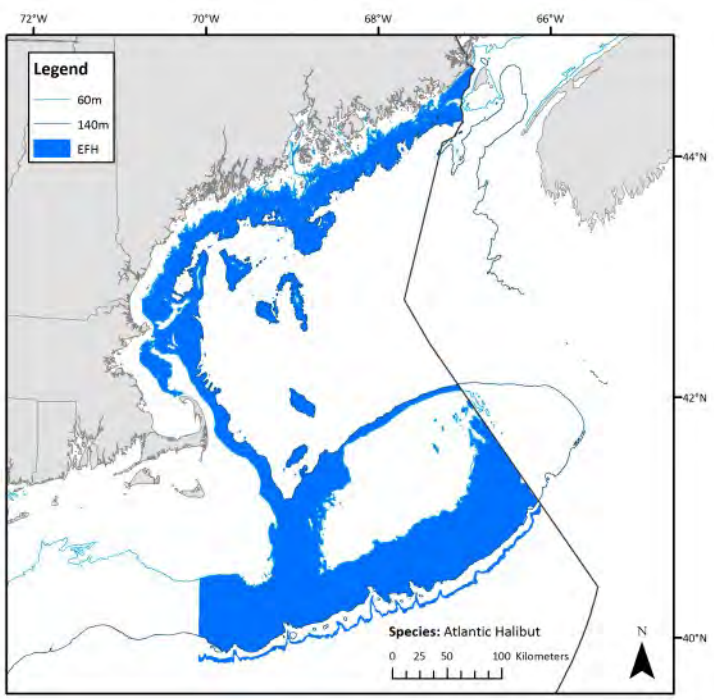
Eggs and Larvae: Pelagic habitats in the Gulf of Maine, on Georges Bank, and on the continental slope south of Georges Bank, as shown on Map 42.

Juveniles and Adults: Benthic habitats in the Gulf of Maine and on Georges Bank in depths of 60 – 140 meters and on the continental slope south of Georges Bank between 400 and 700 meters on sand, gravel, or clay substrates, as shown on Map 42. Juvenile Atlantic halibut nursery grounds are in water 20-60 meters deep in apparently well-defined coastal areas with sandy

[18] The 20-60 meter depth range is where juvenile halibut are most common in Canada (see Appendix B). For the proposed designations, the 60-140 m depth range was based on an analysis of the U.S. trawl survey data for juveniles and adults. The two life stages were combined because very few halibut are caught in the NMFS survey (see Table A-7).

bottoms. Spawning generally occurs over rough or rocky bottom on offshore banks and on the continental slope, but not in the Gulf of Maine.

Map 42 – Atlantic halibut EFH, all life stages.



2.2.1.5 Atlantic wolffish

The no action EFH designation for Atlantic wolffish was approved in Amendment 16 to the Northeast Multispecies FMP when this species was added to the multispecies fishery management unit. Since that time, additional habitat-related information has been compiled in a NMFS status review report that was prepared in response to a petition to list this species as endangered or threatened pursuant to the Endangered Species Act (Atlantic Wolffish Biological Review Team [BRT] 2009). The information in this report, and in the primary sources cited in the review, was used to revise the no action text description. Supplementary habitat information was removed from the no action EFH text descriptions and put into a table in Appendix B, along with information on spawning times and behavior and prey. The map showing the maximum possible extent of EFH for all four life stages of Atlantic wolffish (Map 18) in the new proposed designation is nearly identical to the no action map: small areas that were missing in the original map (e.g., along the Hague Line) were filled in. The no action EFH designation was approved by the Council in June 2009.

The proposed EFH designations for Atlantic wolffish include more specific habitat descriptions than the no action designations. The depth and temperature ranges that define EFH for the juveniles and adults are based on an analysis of NMFS trawl survey data (see BRT report) and, for spawning adults, depth and substrate information has been up-dated using information that was compiled by the Atlantic Wolffish Biological Review Team, which was not available when the original text descriptions were written.[19]

Text descriptions:

Essential fish habitat for Atlantic wolffish (*Anarhichas lupus*), is designated anywhere within the geographic areas that are shown on Map 43 and meets the following conditions. EFH for Atlantic wolffish is limited to waters north of 41˚N latitude and east of 71˚W longitude.

Eggs: Sub-tidal benthic habitats at depths less than 100 meters within the geographic area shown on Map 43. Wolffish egg masses are hidden under rocks and boulders in nests.

Larvae: Pelagic and sub-tidal benthic habitats within the geographic area shown on Map 43. Atlantic wolffish larvae remain near the bottom for up to six days after hatching, but gradually become more buoyant as the yolk sac is absorbed.

Juveniles: (<65 cm total length): Sub-tidal benthic habitats at depths of 70-184 meters within the geographic area shown on Map 43. Juvenile Atlantic wolffish do not have strong substrate preferences.

Adults: (≥65 cm total length)**:** Sub-tidal benthic habitats at depths less than 173 meters within the geographic area shown on Map 43. Adult Atlantic wolffish have been observed spawning and guarding eggs in rocky habitats in less than 30 meters of water in the Gulf of St. Lawrence and Newfoundland and in deeper (50-100 meters) boulder reef habitats in the Gulf of Maine. Egg masses have been collected on the Scotian Shelf in depths of 100-130 meters, indicating that spawning is not restricted to coastal waters. Adults are distributed over a wider variety of sand and gravel substrates once they leave rocky spawning habitats, but are not caught over muddy bottom.

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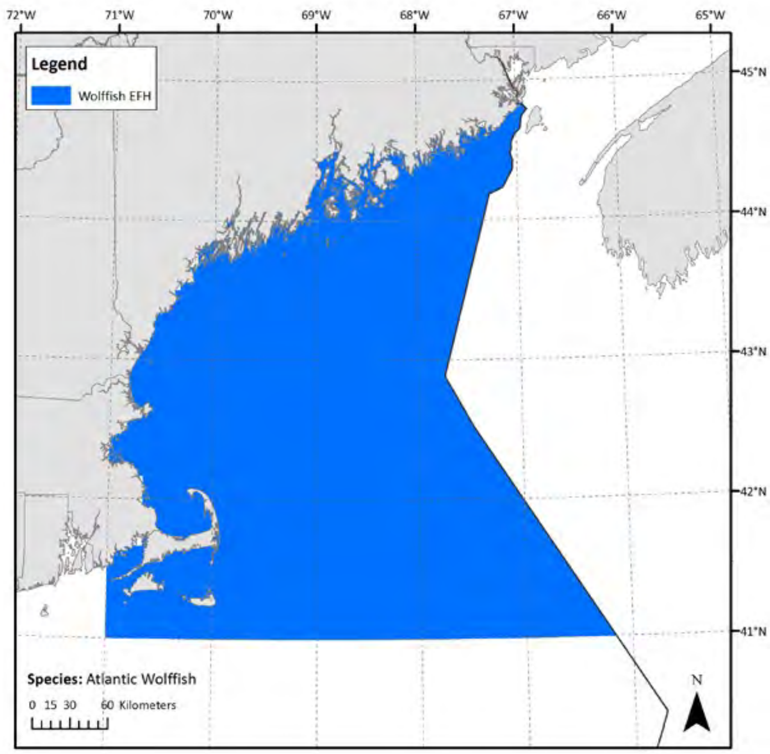
[19] There is no reliable information from the Northeast region that could be used to determine the length at 50% maturity (L_{50}) for this species, but there is published information from other locations in the North Atlantic to support a length of 65cm. Wolffish are unusual in that eggs partially develop in the ovaries and may remain there for years until the time when the female is ready to spawn, at which point the eggs complete their development (and get much larger). Female Atlantic wolffish caught in NMFS trawl surveys have been examined over the years to determine their stage of maturity, but simply classified as having visible eggs or not. More systematic gonadal studies of this species from Iceland and the Canadian maritime provinces clearly show that L_{50} is indirectly related to temperature which affects growth, with fish in colder water growing more slowly and therefore reaching the age at maturity at smaller sizes. Female Atlantic wolffish are 50% mature at 51 cm in Labrador, at 61 cm on the northern Grand Bank, and at 68 cm on the southern Grand Bank where bottom temperatures are warmer (Templeman 1986). Atlantic wolffish from the colder eastern side of Iceland reach L_{50} at 72.6 cm and from the warmer western side of the island at 63.6 cm (Gunnarsson et al. 2006). It seems reasonable to assume that bottom water temperatures in the Gulf of Maine are more similar to western Iceland and the southern Grand Bank. None of the females larger than 65 cm examined during the NMFS trawl surveys in the Gulf of Maine were without eggs and those with eggs ranged from 30 to over 100 cm in length (Northeast Data Poor Stocks Working Group 2009).

Map 43 – Atlantic wolffish EFH, all life stages.



2.2.1.6 Haddock

As in the original EFH designations, the proposed egg and larval EFH maps are based on the complete range (100th) percentile of the observed range of the MARMAP survey data. The proposed EFH maps for juvenile and adult haddock are based on the distributions of depth and bottom temperature that were associated with high catch rates of juveniles or adults in the 1963-2003 spring and fall NMFS trawl surveys. The proposed designations are also based on average catch per tow data for juveniles or adults in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level. The maps include inshore areas where juvenile and adult haddock were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys, and, for the adults, ten minute squares that include historic spawning grounds, as reported by Ames (2002). The proposed designations for juveniles was the 3D method, described above, in the Phase 1 DEIS. For the adults, the proposed map is based on the 3D method, with the addition of the Ames data.

The proposed EFH text description for juveniles refers to a wider range of substrate types than the no action description, including sand. Additional substrate information has also been added to the adult text description. Also, the maximum depth for EFH has been increased from 100 to 140 meters for the juveniles and from 150 to 160 meters for the adults. Compared to the no action EFH map for adults, the proposed map excludes the shallow portion of Georges Bank (<50 meters) and quite a few ten minute squares that were originally designated in the outer Gulf of Maine (>160 meters), but includes considerably more area inside the 160 meter contour and along the Maine coast than was included in the original map.

For the juveniles, modifications to the depth range (maximum 140 instead of 120 meters) and corrections in the mapping conventions (see Appendix A) resulted in the removal of a number of ten minute squares that are deeper than 140 m in the outer Gulf of Maine and the addition of some ten minute squares in the Mid-Atlantic. For the adults, using the adult survey data and habitat features (alt 3D) instead of combining the juvenile and adult data (alt 3E), then adding historic spawning grounds along the Maine coast, extending the maximum depth from 150 to 160 m, and removing ten minute squares that were deeper than 160 m, greatly reduced the amount of EFH designated in the outer Gulf of Maine and east of Long Island. Also, considerably more area was filled in inside the 160 m contour in the Gulf of Maine. For the adults, these modifications caused an expansion of EFH in the inner portion of the Gulf of Maine and the removal of a large number of ten minute squares in the outer gulf that are deeper than 160 meters.

Text descriptions:

Essential fish habitat for haddock (*Melanogrammus aeglefinus*) is designated anywhere within the geographic areas that are shown on the following maps and meets the conditions described below.

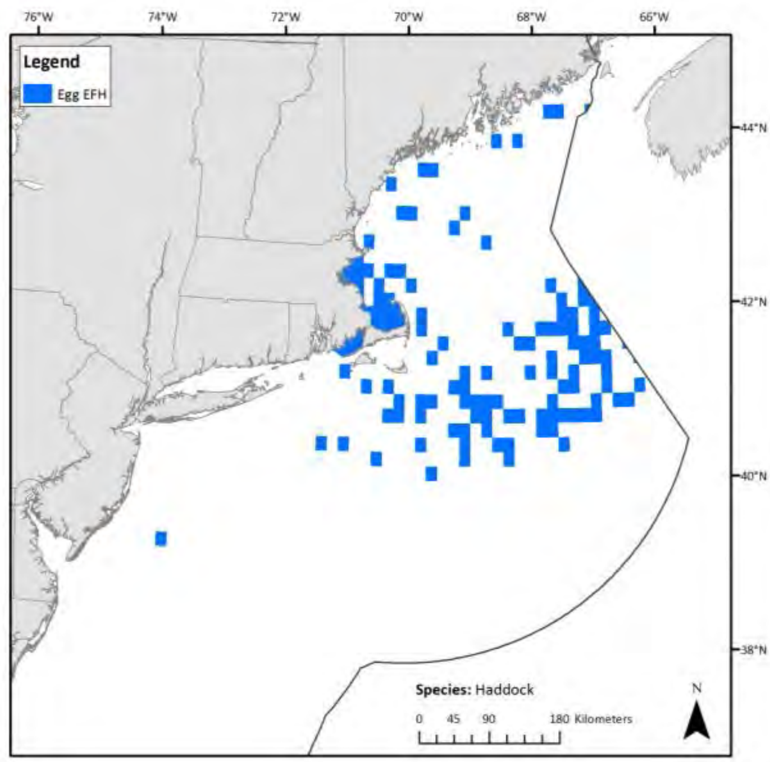
Eggs: Pelagic habitats in coastal and offshore waters in the Gulf of Maine, southern New England, and on Georges Bank, as shown on Map 44.

Larvae: Pelagic habitats in coastal and offshore waters in the Gulf of Maine, the Mid-Atlantic, and on Georges Bank, as shown as shown on Map 45.

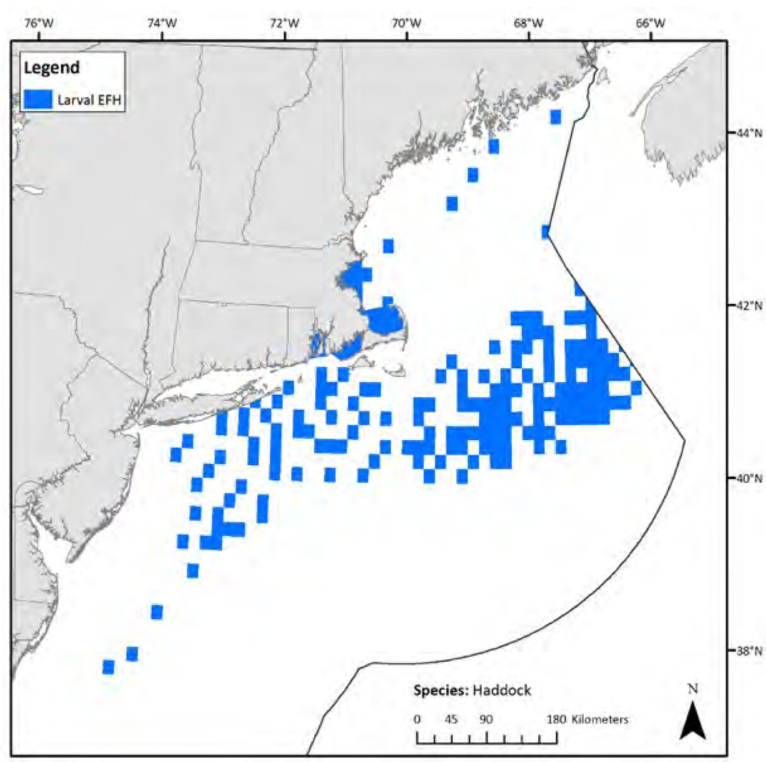
Juveniles: Sub-tidal benthic habitats between 40 and 140 meters in the Gulf of Maine, on Georges Bank and in the Mid-Atlantic region, and as shallow as 20 meters along the coast of Massachusetts, New Hampshire, and Maine, as shown on Map 46. Essential fish habitat for adult haddock occurs on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel. Young-of-the-year juveniles settle on sand and gravel on Georges Bank, but are found predominantly on gravel pavement areas within a few months after settlement. As they grow, they disperse over a greater variety of substrate types on the bank. Young-of-the-year haddock do not inhabit shallow, inshore habitats.

Adults: Sub-tidal benthic habitats between 50 and 160 meters in the Gulf of Maine, on Georges Bank, and in southern New England, as shown on Map 47. Essential fish habitat for adult haddock occurs on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel substrates. They also are found adjacent to boulders and cobbles along the margins of rocky reefs in the Gulf of Maine.

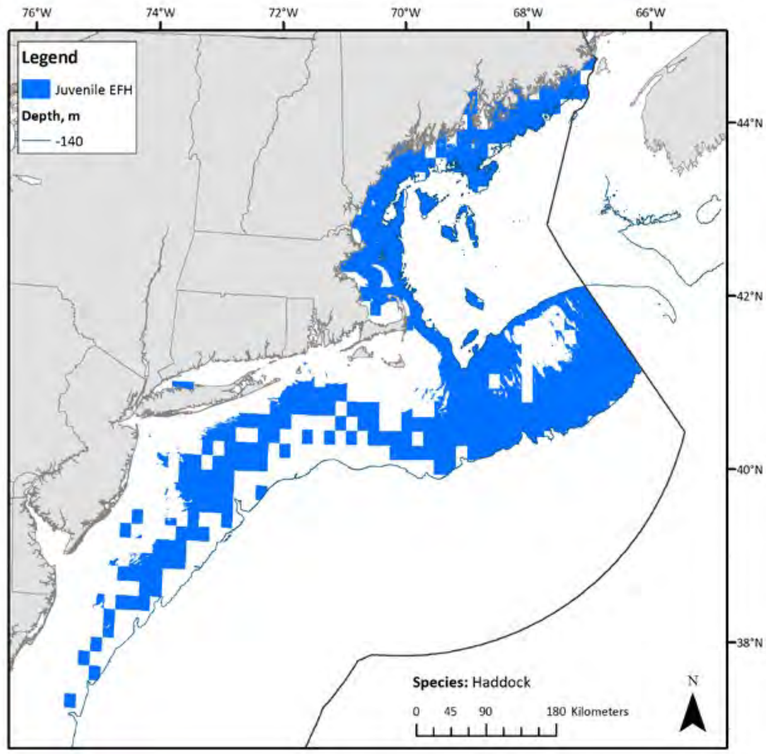
Map 44 – Haddock egg EFH.



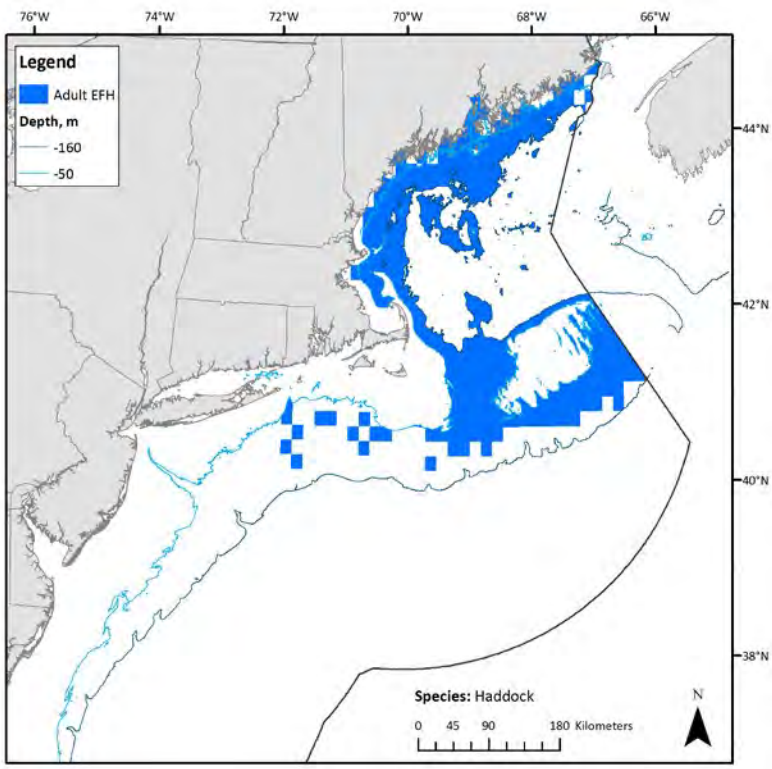
Map 45 – Haddock larval EFH.



Map 46 – Haddock juvenile EFH.



Map 47 – Haddock adult EFH.



2.2.1.7 Ocean pout

There is no true larval stage for this species, so the Council proposes to eliminate the no action larval EFH designation and not replace it with anything. The proposed EFH map for ocean pout eggs is based on the average catch per tow of adults in ten minute squares of latitude and longitude during 1968-2005 in the fall and spring NMFS trawl survey at the 75th percentile of catch and is limited by the maximum depth (100 meters) at which this species reportedly spawns in the Gulf of Maine (see Appendix B). It also includes ten minute squares in inshore areas where adult ocean pout were caught in state trawl surveys in more than 10% of the tows, as well as those bays and estuaries identified by the ELMR program where ocean pout eggs were "common" or "abundant." The proposed EFH text description increases the maximum depth for ocean pout eggs from 50 to 100 meters. The proposed map looks similar to the no action map and the map that was approved in 2007 (Alternative 2C in the DEIS - see Appendix), but application of the 100 meter depth limit resulted in a clear definition of bathymetric features (e.g., Jeffreys Ledge and the Great South Channel) in the southwestern Gulf of Maine.[20]

The proposed EFH maps for juvenile and adult ocean pout are based on the distributions of depths and bottom temperatures that are associated with high catch rates of juveniles and adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. They also are based on average catch per tow data for juveniles and adults in ten minute squares of latitude and

[20] The status quo map for ocean pout eggs combined the 90th percentile juvenile and adult survey data.

longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 75th percentile of catch level, and include inshore areas where juvenile or adult ocean pout were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys, and ELMR information for coastal bays and estuaries. These designations were referred to as 3C alternatives in the Phase 1 DEIS.

The proposed juvenile and adult maps extend over the same geographical area as the no action maps, but depict a specific depth range in the southwestern Gulf of Maine and in the Great South Channel, and, for the adults, on Georges Bank. For the juveniles, a number of ten minute squares in deep water (>120 m) in the Gulf of Maine that were included in the no action EFH map and in the map that was approved in 2007 have been removed from the proposed new map. The proposed adult EFH map is very similar to the no action adult map. Major modifications made to the new maps (since they were approved) were an increase in the maximum depths from 70 to 120 meters for the juveniles and 100 to 140 meters for the adults. The proposed text descriptions for juveniles and adults both define a wider variety of substrates than the no action descriptions, with more specificity. They also extend EFH into deeper water (see above), and, in the case of the juveniles, the intertidal zone is specifically defined as EFH.

Text descriptions:

Essential fish habitat for ocean pout (*Macrozoarces americanus*) is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 20 and meets the conditions described below.

Eggs: Hard bottom habitats on Georges Bank, in the Gulf of Maine, and in the Mid-Atlantic Bight (see Map 48), as well as the high salinity zones of the bays and estuaries listed in Table 20. Eggs are laid in gelatinous masses, generally in sheltered nests, holes, or rocky crevices. Essential fish habitat for ocean pout eggs occurs in depths less than 100 meters on rocky bottom habitats.

Juveniles: Intertidal and sub-tidal benthic habitats in the Gulf of Maine and on the continental shelf north of Cape May, New Jersey, on the southern portion of Georges Bank, and in the high salinity zones of a number of bays and estuaries north of Cape Cod, extending to a maximum depth of 120 meters (see Map 49 and Table 20). Essential fish habitat for juvenile ocean pout occurs on a wide variety of substrates, including shells, rocks, algae, soft sediments, sand, and gravel.

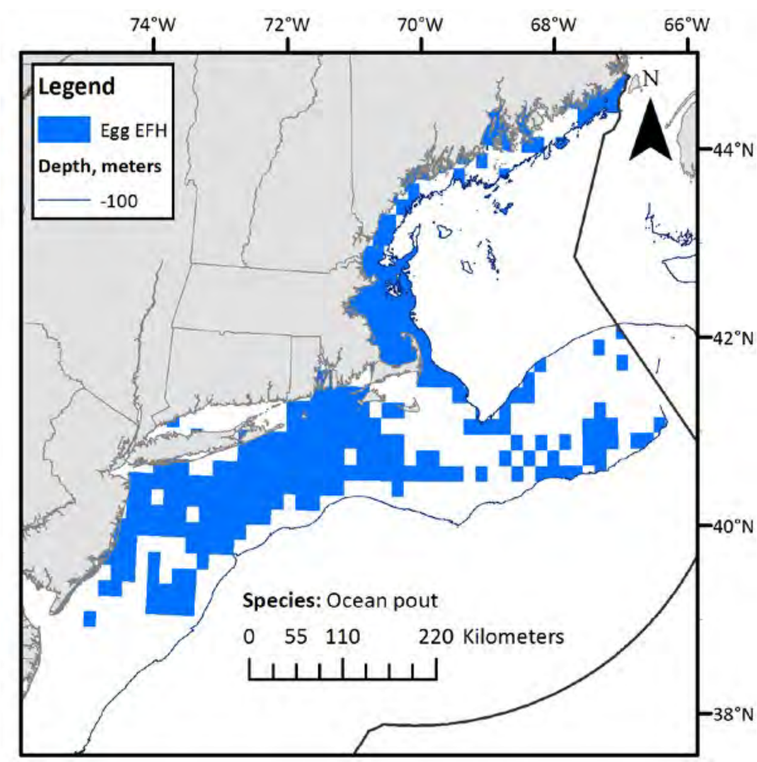
Adults: Sub-tidal benthic habitats between 20 and 140 meters in the Gulf of Maine, on Georges Bank, in coastal and continental shelf waters north of Cape May, New Jersey, and in the high salinity zones of a number of bays and estuaries north of Cape Cod (see Map 50 and Table 20). Essential fish habitat for adult ocean pout includes mud and sand, particularly in association with structure forming habitat types; i.e. shells, gravel, or boulders. In softer sediments, they burrow tail first and leave a depression on the sediment surface. Ocean pout congregate in rocky areas prior to spawning and frequently occupy nesting holes under rocks or in crevices in depths less than 100 meters.

Table 20 – Ocean pout EFH designation for estuaries and embayments

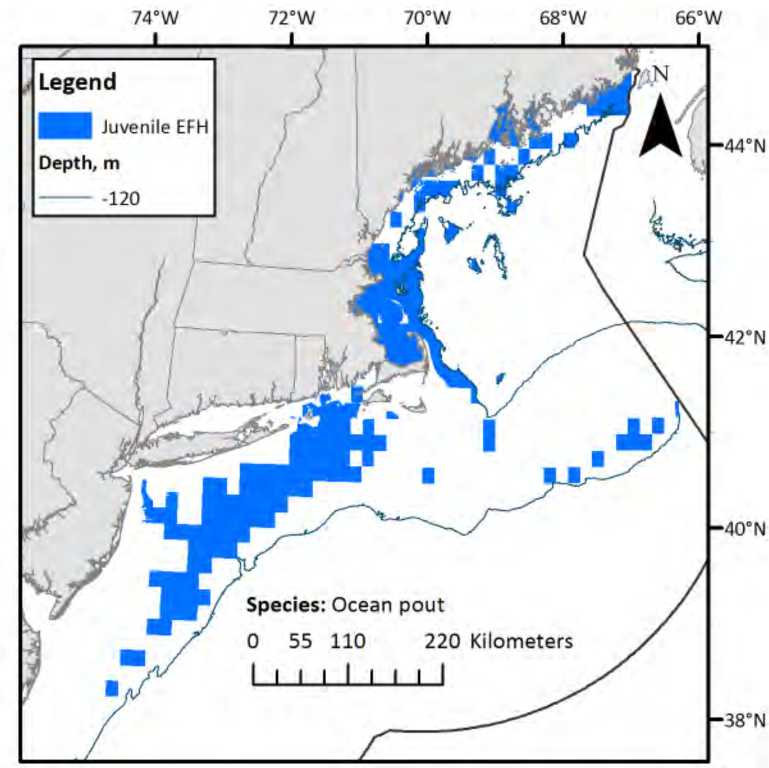
Estuaries and Embayments	Eggs	Juveniles	Adults
Passamaquoddy Bay	S	S	S
Englishman/Machias Bay	S	S	S
Narraguagus Bay	S	S	S
Blue Hill Bay	S	S	S
Penobscot Bay	S	S	S
Muscongus Bay	S	S	S
Damariscotta River	S	S	S
Sheepscot River	S	S	S
Kennebec / Androscoggin	S	S	S
Casco Bay	S	S	S
Saco Bay	S	S	S
Massachusetts Bay	S	S	S
Boston Harbor		S	S
Cape Cod Bay	S	S	S

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).

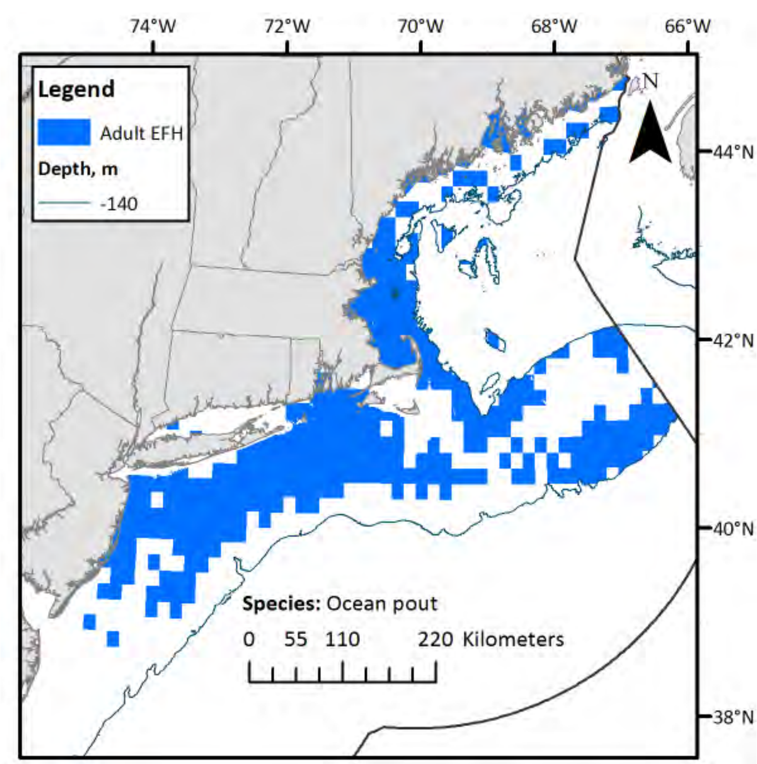
Map 48 – Ocean pout egg EFH.



Map 49 – Ocean pout juvenile EFH.



Map 50 – Ocean pout adult EFH.



2.2.1.8 Pollock

The proposed EFH maps for pollock eggs and larvae are based upon the relative abundance of adult pollock during 1968-2005 in the fall and spring NMFS trawl surveys at the 90th percentile catch level and the relative abundance of eggs and larvae, respectively, during 1978-1987 in the MARMAP ichthyoplankton surveys at the 90th percentile area level. The designations also include ten minute squares in inshore areas where adult pollock were caught in state trawl surveys in more than 10% of the tows made in individual squares, as well as those bays and estuaries identified by the ELMR program where pollock eggs or larvae, respectively, were "common" or "abundant”. The proposed new egg and larval maps include a number of scattered ten minute squares on Georges Bank and in southern New England that were not included in the maps that were approved in 2007 (see Appendix) or in the no action maps. The new larval map would extend EFH further south into the Mid-Atlantic.[21]

The proposed EFH maps for juvenile and adult pollock were based on preferred depth and bottom temperature ranges for each life stage that were determined from graphical 1963-2003 spring and fall NMFS trawl survey data, on average catch per tow data for juveniles and adults in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level, and on ELMR information for coastal bays and estuaries. The juvenile map also includes inshore areas where juveniles were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys.[22] These designations were referred to as 3D alternatives in the Phase 1 DEIS.

The proposed juvenile EFH map for this species looks very different than the no action map. Because EFH in the proposed designation extends no deeper than 180 meters, deep water in the outer Gulf of Maine is no longer included in the map. Instead, much more area in the Gulf that is shallower than 180 meters would now be EFH. Both the proposed and the no action adult maps identify the outer Gulf of Maine as EFH, but the new map is restricted to depths greater than 80 meters within the NMFS survey area. It also includes a few new ten minute squares on the southern flank of Georges Bank and excludes a large area on the shelf southeast of Long Island that was added to the no action map by the fishing industry. The high salinity zones of Long Island Sound, Cape Cod Bay, and Massachusetts Bay would remain designated areas for the juveniles and adults based on the ELMR information (see Table 21).

No revisions were made to the depth range used to create the proposed juvenile EFH map since it was approved for the DEIS, but a few ten minute squares that are deeper than 180 meters have been removed from the new map. The modified adult map is very different from the original proposed map, based on a re-analysis of the data, due to the increase in the maximum depth from 180 to 300 meters, which would extend EFH into the outer Gulf of Maine.

[21] The status quo designations relied on survey data for adults at the 90th percentile as a proxy for eggs, larvae, and juveniles.
[22] Very few adult pollock are caught in inshore trawl surveys, not enough to trigger the 10% frequency of occurrence threshold anywhere.

Like the no action text description, the proposed juvenile text description defines EFH as extending to the shoreline, but defines it explicitly to include the intertidal zone. The maximum depth for EFH is defined as 180 meters for the juveniles and 300 meters for the adults versus 250 and 365 meters, respectively, in the no action descriptions. In view of the fact that pollock use the entire water column, both of the proposed EFH descriptions refer to pelagic and benthic habitats, not just bottom habitats. A variety of substrates are described for the juveniles, but not for the adults because they show little preference for specific substrate types.

Text descriptions:

Essential fish habitat for pollock (*Pollachius virens*) is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 21 and meets the conditions described below.

Eggs: Pelagic inshore and offshore habitats in the Gulf of Maine, on Georges Bank, and in southern New England, as shown on Map 51, including the bays and estuaries listed in Table 21.

Larvae: Pelagic inshore and offshore habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, as shown on Map 52, including the bays and estuaries listed in Table 21.

Juveniles: Inshore and offshore pelagic and benthic habitats from the intertidal zone to 180 meters in the Gulf of Maine, in Long Island Sound, and Narragansett Bay, between 40 and 180 meters on western Georges Bank and the Great South Channel (see Map 53), and in mixed and full salinity waters in a number of bays and estuaries north of Cape Cod (Table 21). Essential fish habitat for juvenile pollock consists of rocky bottom habitats with attached macroalgae (rockweed and kelp) that provide refuge from predators. Shallow water eelgrass beds are also essential habitats for young-of-the-year pollock in the Gulf of Maine. Older juveniles move into deeper water into habitats also occupied by adults.

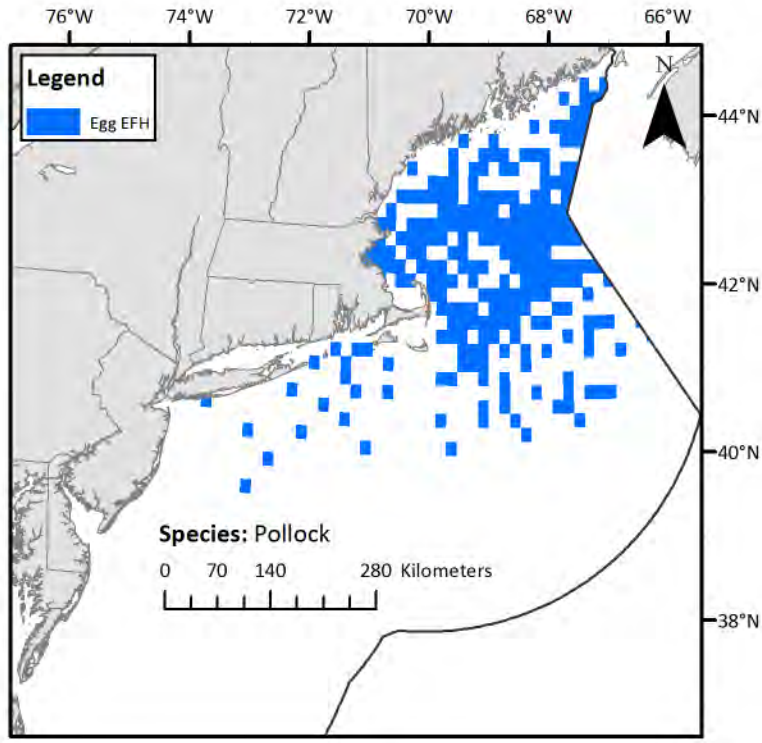
Adults: Offshore pelagic and benthic habitats in the Gulf of Maine and, to a lesser extent, on the southern portion of Georges Bank between 80 and 300 meters, and in shallower sub-tidal habitats in Long Island Sound, Massachusetts Bay, and Cape Cod Bay (see Map 54 and Table 21). Essential habitats for adult pollock are the tops and edges of offshore banks and shoals (e.g., Cashes Ledge) with mixed rocky substrates, often with attached macro algae.

Table 21 – Pollock EFH designation for estuaries and embayments

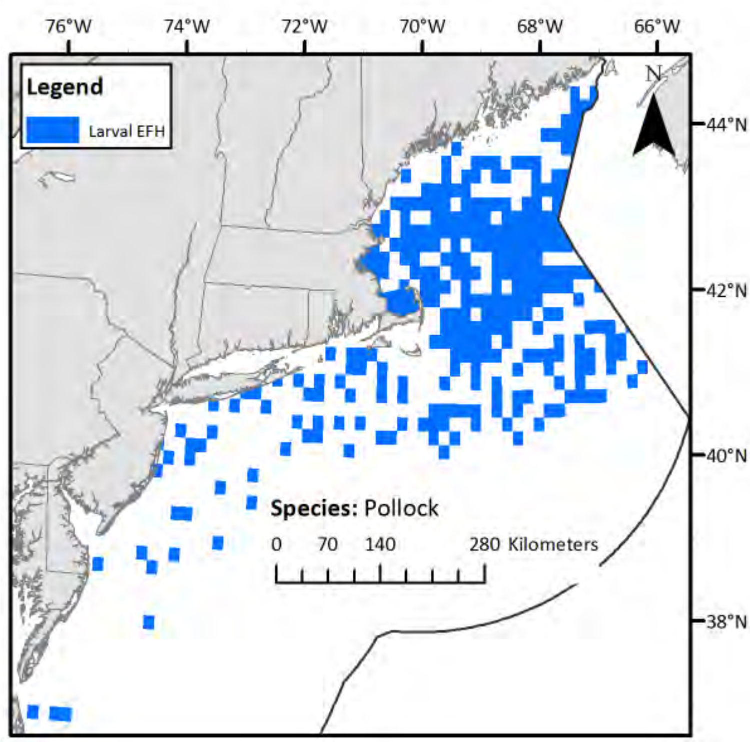
Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults
Passamaquoddy Bay		S	S,M	S
Englishman/Machias Bay			S,M	
Narraguagus Bay			S,M	
Blue Hill Bay			S,M	
Penobscot Bay			S,M	
Muscongus Bay			S,M	
Damariscotta River			S,M	S
Sheepscot River		S	S,M	
Kennebec / Androscoggin			S,M	
Casco Bay			S,M	
Saco Bay			S,M	
Great Bay	S	S	S	
Hampton Harbor*	S	S	S	
Merrimack River	M	M	M	
Plum Island Sound*	S	S	S	
Massachusetts Bay	S	S	S	S
Boston Harbor	S	S	S,M	
Cape Cod Bay		S	S,M	S
Waquoit Bay			S	
Long Island Sound			S	S
Great South Bay			S	

S ≡The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).
** = This water body was not included in the original ELMR reports, but it was included in the salinity zone maps that were appended to all the relevant fishery management plans and amendments which implemented the no action EFH designations; EFH designations were inferred in these locations if there were ELMR-based designations in the adjacent north and south locations.*

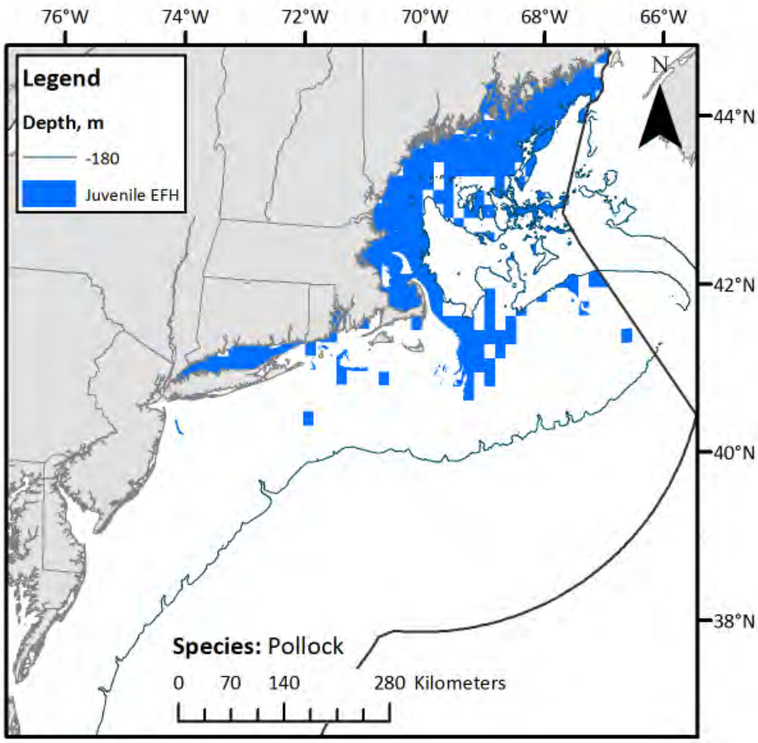
Map 51 – Pollock egg EFH.



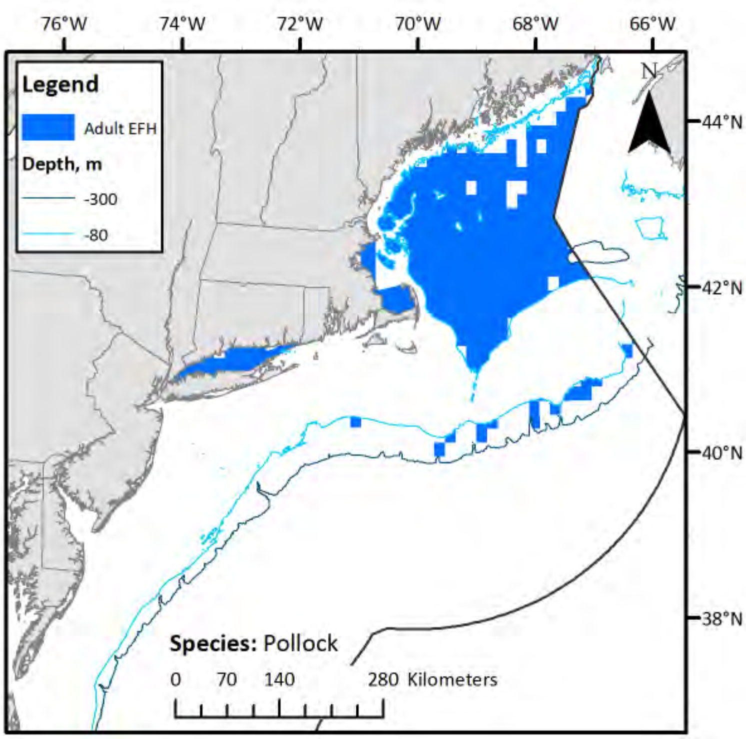
Map 52 – Pollock larval EFH.



Map 53 – Pollock juvenile EFH.



Map 54 – Pollock adult EFH.



2.2.1.9 White hake

Because no MARMAP data were available for the eggs and larvae of this species, the juveniles and adults were used as proxies to define the geographical extent of EFH for these two lifestages.[23] The proposed EFH map for white hake eggs is based upon average catch per tow data for adults in ten minute squares of latitude and longitude during 1968-2005 in the fall and spring NMFS trawl survey at the 90th percentile catch level and depths and bottom temperatures that are associated with high catch rates of adults in the 1963-2003 spring and fall NMFS trawl surveys. It also includes ten minute squares in inshore areas where adult white hake were caught in state trawl surveys in 10% or more of the tows made in any given square, bays and estuaries in the Gulf of Maine identified by the ELMR program where white hake eggs or adults were reported to be common or abundant, and a depth-defined portion of the continental slope where white hake spawn. The proposed EFH map for white hake larvae was also generated based upon the 90th percentile, but in this case, using catch and habitat data for juveniles. It also includes inshore survey data for juveniles and ELMR areas in the Gulf of Maine where white hake larvae or juveniles were reported to be common or abundant, but no additional coverage for the continental slope.[24]

In 2007, the Council approved a single modified abundance based egg and larval EFH map for white hake that was based on the distribution of juveniles at the 90th percentile level, plus inshore survey ten minute squares and ELMR areas for eggs and larvae, but not juveniles, and separate abundance plus habitat considerations alternative designations for the juveniles and adults (see Appendix C). The new maps for eggs and larvae were approved by the Habitat Committee in 2011. The new larval EFH map covers more of the outer Gulf of Maine than the map that was approved in 2007 and extends EFH over a much larger portion of Georges Bank and southern New England, with a few areas in the New York Bight and along the outer shelf break. The proposed map for eggs, as modified in 2011, includes a continuous stretch of EFH along the outer shelf that is not in the original map.

The proposed EFH maps for juvenile and adult white hake are based on the distributions of depths and bottom temperatures that are associated with high catch rates of juveniles and adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. They are also based on average catch rates of juveniles or adults in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile catch level, include inshore areas where juvenile or adult white hake were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys, and ELMR information for the Gulf of Maine. These designations were 3D alternatives in the Phase 1 DEIS.

The proposed EFH map for juveniles extends over most of the same geographic area as the no action map, but includes all the nearshore waters in the Gulf of Maine and more area on the continental shelf. The proposed juvenile designation also refers specifically to the intertidal zone

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[23] White hake eggs and larvae were not differentiated from eggs and larvae of red, spotted and longfin hake in the MARMAP surveys.

[24] The proposed larval and juvenile maps are the same because the juvenile survey data is continuous in Gulf of Maine coastal waters, so the fact that there are ELMR areas there which are designated as EFH for juveniles and not larvae (seeTable 22) is irrelevant.

and extends EFH into deeper water on the shelf (300 vs 225 meters). The proposed designation for adult white hake (text and map) would extend EFH on to the continental slope down to 900 meters and limit EFH on the outer continental shelf to depths greater than 100 meters. The proposed adult map also eliminates some areas in the inner Gulf of Maine that were included in the no action map.

As modified with a broader annual depth range and a shallower minimum depth, the proposed juvenile map extends EFH into the 30-60 and 120-140 meters depth ranges in the Gulf of Maine. An error in the extent of the continental slope EFH data layer in the DEIS has been corrected, reducing the maximum depth from 2,250 to 900 meters. Also, a few partial ten minute squares on the outer shelf that met the depth and bottom temperature criteria for adult white hake have been added to the modified EFH map.

Text descriptions:

Essential fish habitat for white hake (*Urophycis tenuis*) is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 22 and meets the conditions described below.

Eggs: Pelagic habitats in the Gulf of Maine, including Massachusetts and Cape Cod bays, and the outer continental shelf and slope (see and Map 55).

Larvae: Pelagic habitats in the Gulf of Maine, in southern New England, and on Georges Bank, as shown in Map 56. Early stage white hake larvae have been collected on the continental slope, but cross the shelf-slope front and use nearshore habitats for juvenile nurseries. Larger larvae and pelagic juveniles have been found only on the continental shelf.

Juveniles: Intertidal and sub-tidal estuarine and marine habitats in the Gulf of Maine, on Georges Bank, and in southern New England, including mixed and high salinity zones in a number of bays and estuaries north of Cape Cod (see Table 22), to a maximum depth of 300 meters (see Map 57). Pelagic phase juveniles remain in the water column for about two months. In nearshore waters, essential fish habitat for benthic phase juveniles occurs on fine-grained, sandy substrates in eelgrass, macroalgae, and un-vegetated habitats. In the Mid-Atlantic, most juveniles settle to the bottom on the continental shelf, but some enter estuaries, especially those in southern New England. Older young-of-the-year juveniles occupy the same habitat types as the recently-settled juveniles, but move into deeper water (>50 meters).

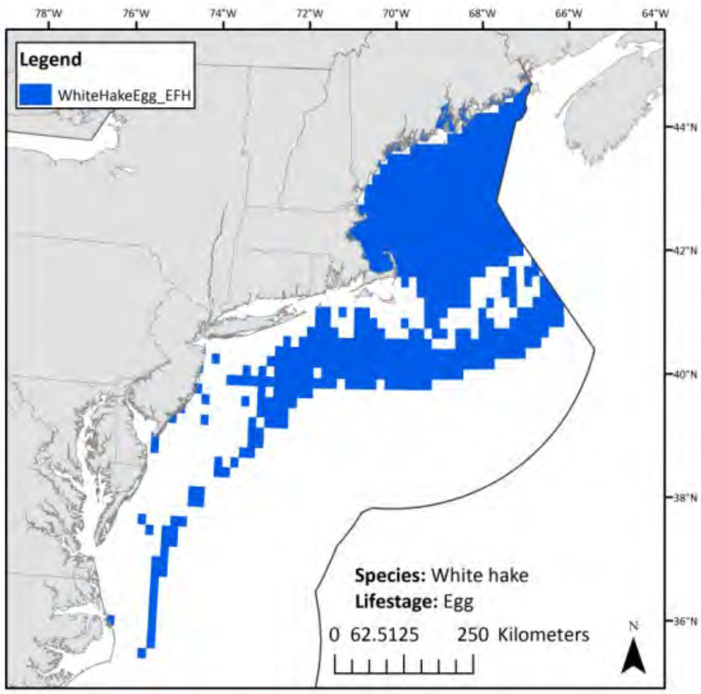
Adults: Sub-tidal benthic habitats in the Gulf of Maine, including depths greater than 25 meters in certain mixed and high salinity zones portions of a number of bays and estuaries (see Table 22), between 100 and 400 meters in the outer gulf, and between 400 and 900 meters on the outer continental shelf and slope (see Map 58). Essential fish habitat for adult white hake occurs on fine-grained, muddy substrates and in mixed soft and rocky habitats. Spawning takes place in deep water on the continental slope and in Canadian waters.

Table 22 – White hake EFH designation for estuaries and embayments.

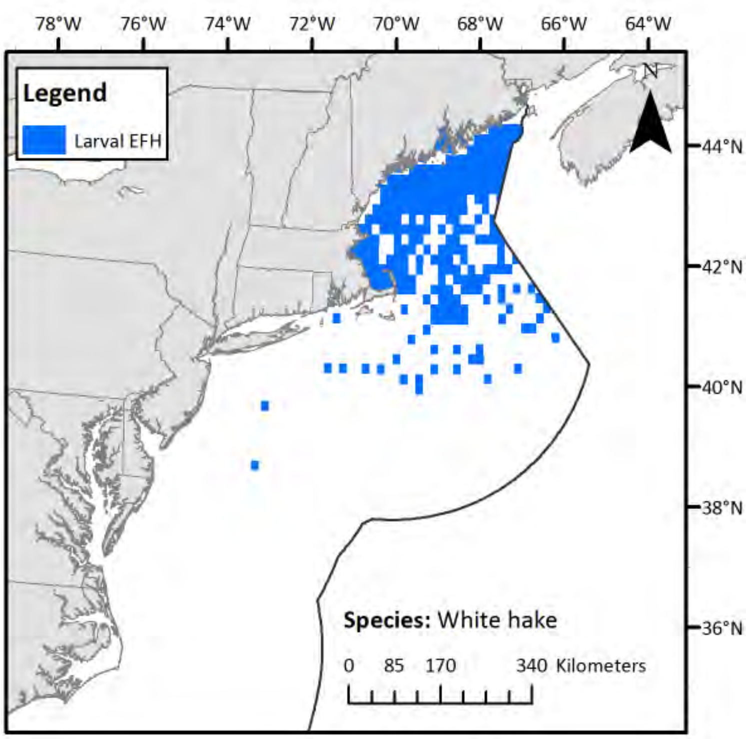
Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults
Passamaquoddy Bay			S,M	S,M
Englishman/Machias Bay			S,M	S
Narraguagus Bay			S,M	S
Blue Hill Bay			S,M	S
Penobscot Bay			S,M	S
Muscongus Bay			S,M	S,M
Damariscotta River			S,M	S,M
Sheepscot River			S,M	S,M
Kennebec / Androscoggin			S,M	S,M
Casco Bay			S,M	S,M
Saco Bay			S,M	S,M
Wells Harbor			S,M	S,M
Great Bay	S		S	S
Hampton Harbor*	S,M		S,M	S,M
Merrimack River	M			
Plum Island Sound*	S,M		S,M	S,M
Massachusetts Bay	S	S	S	S
Boston Harbor	S	S	S	S
Cape Cod Bay	S	S	S,M	S,M

S ≡The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).
** = This water body was not included in the original ELMR reports, but it was included in the salinity zone maps that were appended to all the relevant fishery management plans and amendments which implemented the no action EFH designations; EFH designations were inferred in these locations if there were ELMR-based designations in the adjacent north and south locations.*

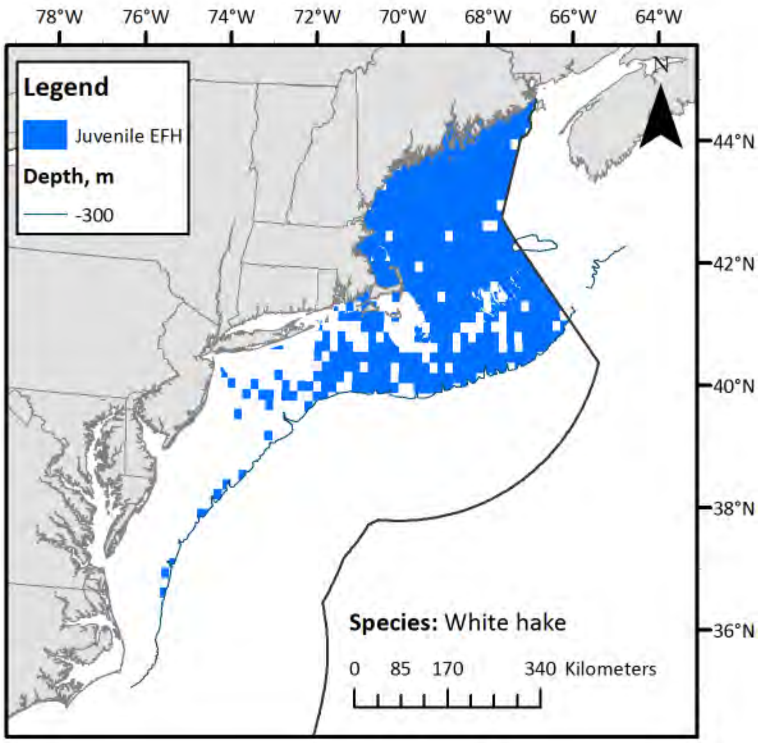
Map 55 – White hake egg EFH.



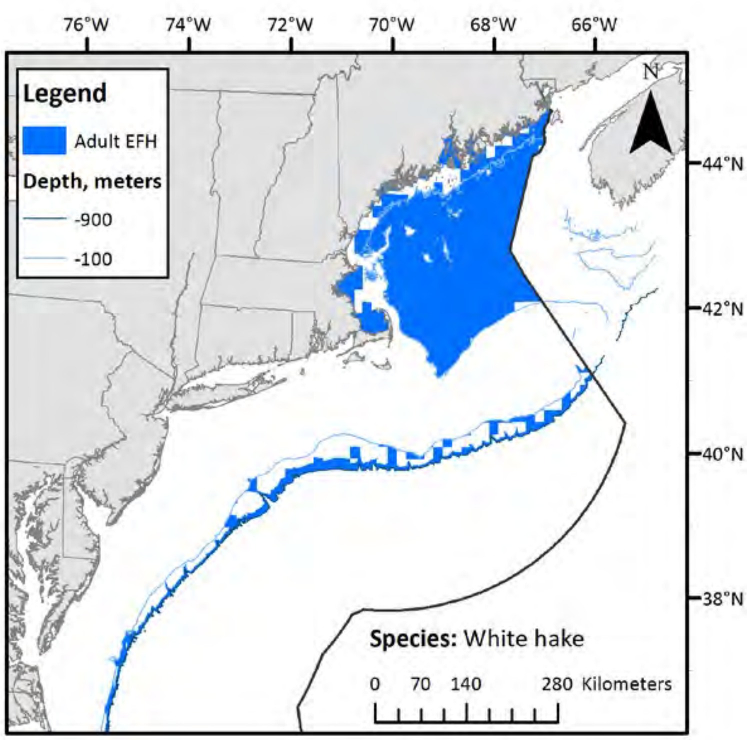
Map 56 – White hake larval EFH.



Map 57 – White hake juvenile EFH.



Map 58 – White hake adult EFH.



2.2.1.10 Windowpane flounder

As in the original EFH designations, the proposed egg and larval EFH maps are based on the 90th percentile of the observed range of the MARMAP survey data. These designations also include those bays and estuaries identified by the ELMR program as supporting windowpane flounder eggs or larvae at the "common" or "abundant" level.

The proposed EFH maps for juvenile and adult windowpane flounder are based on the distributions of depths and bottom temperatures that are associated with high catch rates of juveniles and adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. They are also based on average catch per tow data in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level, and they include inshore areas where juvenile or adult windowpane were caught in 10% or more of the tows made in individual ten minute squares during state trawl surveys and ELMR information. Inshore survey data used in the proposed map of juvenile EFH includes SEAMAP survey data between Cape Hatteras and northern Florida.[25] These designations were 3E alternatives in the Phase 1 DEIS.[26]

The new designation for juvenile windowpane flounder would limit EFH to a maximum depth of 60 meters, not 100 meters as defined in the no action designation. The maximum depth for adult EFH would only change from 75 to 70 meters. Under the proposed designations, EFH for the juveniles and adults would explicitly include the intertidal zone. The preferred sediment types (mud and sand) are the same in the proposed and no action EFH descriptions for both life stages.

The proposed and the no action EFH maps for the juveniles and adults include coastal areas throughout the entire Northeast region, plus the shallower portion of Georges Bank. The addition of trawl survey data from the Gulf of Maine caused more ten minute squares along the Maine coast to be designated, especially for juveniles. The primary difference between the no action and the proposed designations is the addition of coastal waters south of Cape Hatteras to the juvenile EFH map. The approved 3D alternative for juveniles in the DEIS did not include the SEAMAP survey data. Modification of the approved maps for juvenile and adult windowpane flounder resulted in the removal of a few isolated ten minute squares on the outer continental shelf that met the 90th percentile catch criterion, but were deeper than the defined maximum depths of 60 and 70 meters.

Text descriptions:

Essential fish habitat for windowpane flounder (*Scophthalmus aquosus*) is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 23 and meets the conditions described below.

[25] SEAMAP is an acronym for the Southeast Area Monitoring and Assessment Program. This trawl survey of coastal waters between Cape Hatteras, North Carolina, and Cape Canaveral, Florida, began in 1986 and is conducted by the South Carolina Department of Natural Resources. According to SCDNR staff, the great majority of windowpane flounder caught in this survey are juveniles (no length data are collected).

[26] The preferred alternatives in the DEIS were called 3E alternatives because a few unsurveyed ten minute squares were added to the 3D maps.

Eggs and Larvae: Pelagic habitats on the continental shelf from Georges Bank to Cape Hatteras and in mixed and high salinity zones of coastal bays and estuaries throughout the region (see Map 59, Map 60, and Table 23).

Juveniles: Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to northern Florida, as shown on Map 61, including mixed and high salinity zones in the bays and estuaries listed inTable 23. Essential fish habitat for juvenile windowpane flounder is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 60 meters. Young-of-the-year juveniles prefer sand over mud.

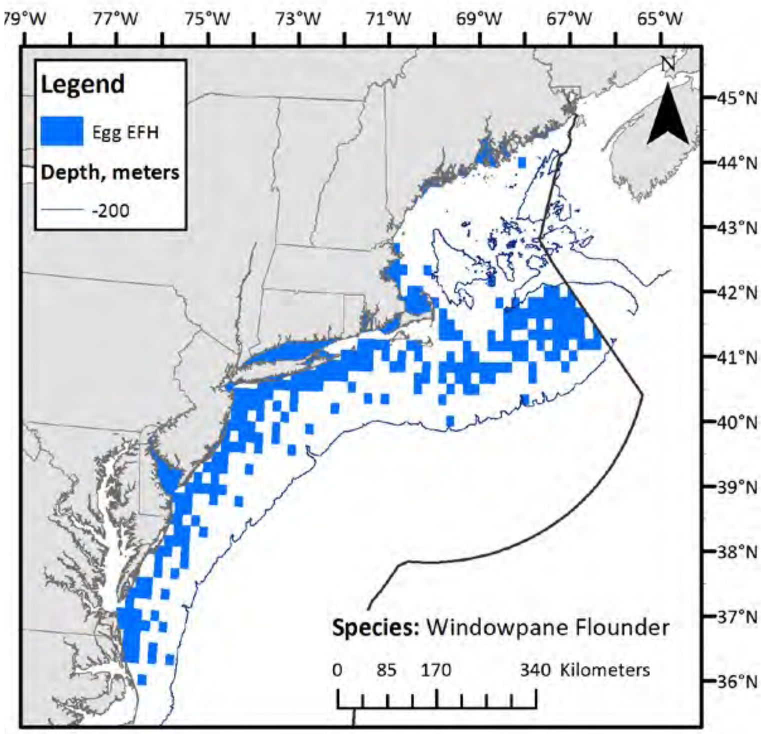
Adults: Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to Cape Hatteras, as shown on Map 62, including mixed and high salinity zones in the bays and estuaries listed in Table 23. Essential fish habitat for adult windowpane flounder is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 70 meters.

Table 23 – Windowpane flounder EFH designation for estuaries and embayments

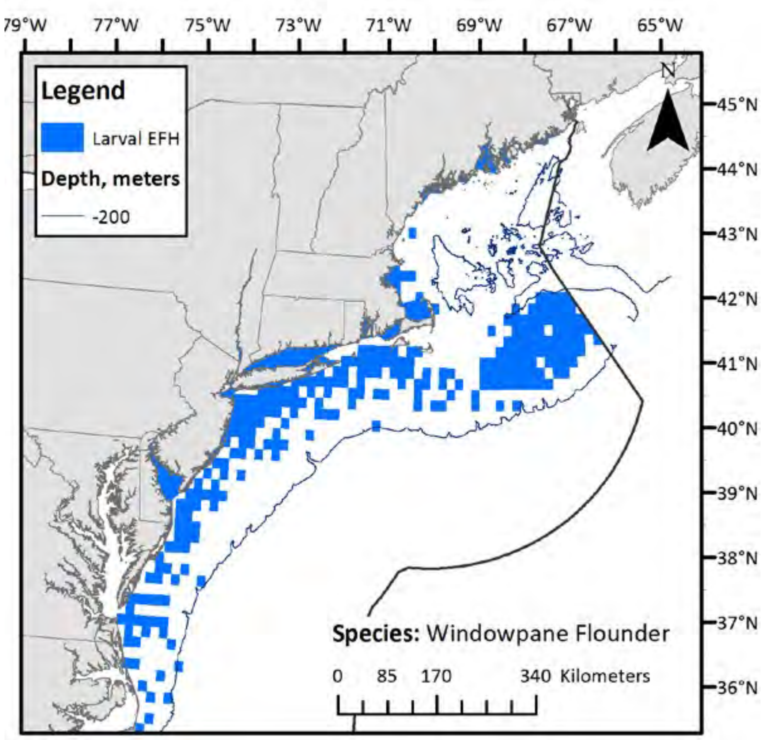
Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults
Passamaquoddy Bay	S,M	S,M	S,M	S,M
Englishman/Machias Bay	S,M	S,M	S,M	S,M
Narraguagus Bay	S,M	S,M	S,M	S,M
Blue Hill Bay	S,M	S,M	S,M	S,M
Penobscot Bay	S,M	S,M	S,M	S,M
Muscongus Bay	S,M	S,M	S,M	S,M
Damariscotta River	S,M	S,M	S,M	S,M
Sheepscot River	S,M	S,M	S,M	S,M
Kennebec / Androscoggin	S,M	S,M	S,M	S,M
Casco Bay	S,M	S,M	S,M	S,M
Saco Bay	S,M	S,M	S,M	S,M
Wells Harbor	S,M	S,M	S,M	S,M
Great Bay	S	S	S	S
Hampton Harbor*	S,M	S,M	S,M	S,M
Plum Island Sound*	S,M	S,M	S,M	S,M
Massachusetts Bay	S	S	S	S
Boston Harbor	S,M	S,M	S,M	S,M
Cape Cod Bay	S,M	S,M	S,M	S,M
Waquoit Bay	S,M	S,M	S,M	S,M
Buzzards Bay	S,M	S,M	S,M	S,M
Narragansett Bay	S,M	S,M	S,M	S,M
Long Island Sound	S,M	S,M	S,M	S,M
Connecticut River	M	M	M	M
Gardiners Bay	S,M	S,M	S,M	S,M
Great South Bay	S,M	S,M	S,M	S,M
Hudson River / Raritan Bay	S	S,M	S,M	S,M
Barnegat Bay	S,M	S,M	S,M	S,M
New Jersey Inland Bays	S,M	S,M	S,M	S,M
Delaware Bay			S,M	S,M
Delaware Inland Bays*	S,M	S,M	S,M	S,M
Maryland Inland Bays*	S,M	S,M	S,M	S,M
Chincoteague Bay			S	S
Chesapeake Bay			S,M	S,M
Tangier/Pocomoke Sound			M	M

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).
** = This water body was not included in the original ELMR reports, but it was included in the salinity zone maps that were appended to all the relevant fishery management plans and amendments which implemented the no action EFH designations; EFH designations were inferred in these locations if there were ELMR-based designations in the adjacent north and south locations.*

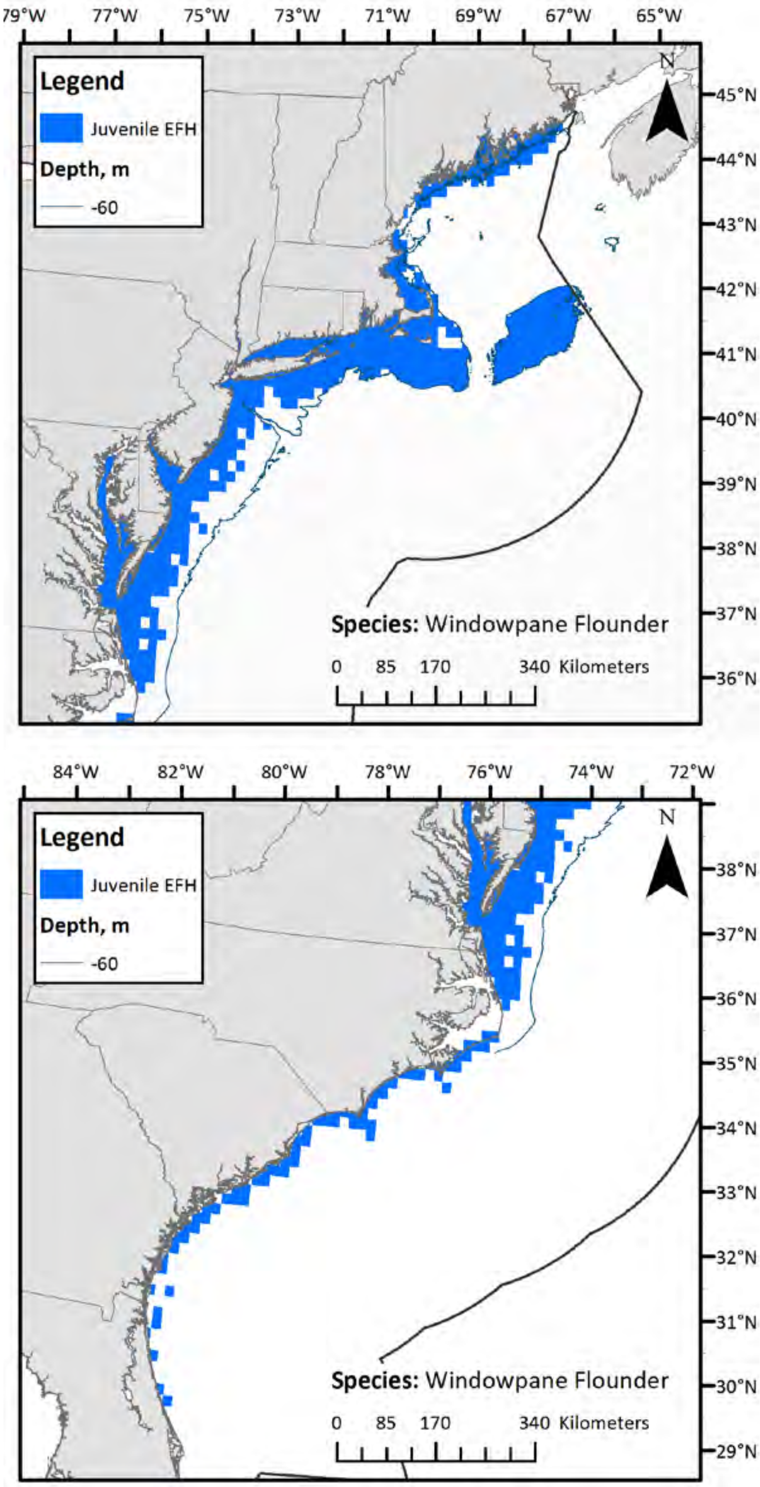
Map 59 – Windowpane flounder egg EFH.



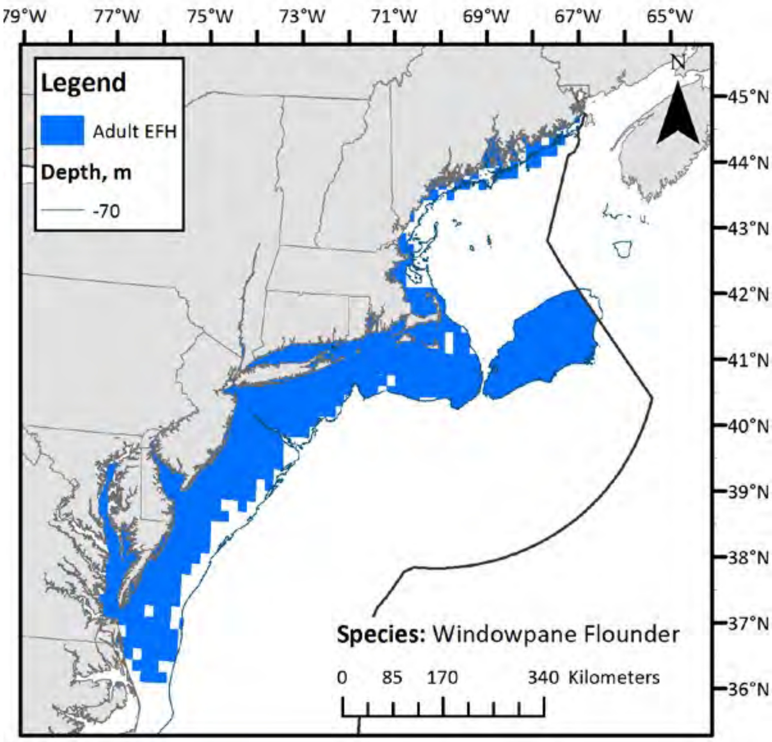
Map 60 – Windowpane flounder larval EFH.



Map 61 – Windowpane flounder juvenile EFH. Upper panel shows northern portion of range; lower panel shows southern portion of range.



Map 62 – Windowpane flounder adult EFH.



2.2.1.11 Winter flounder

The preferred designation for winter flounder eggs defines EFH as sub-tidal coastal waters from the shoreline to a maximum depth of 5 meters[27] from Cape Cod to Absecon Inlet, New Jersey, and from the shoreline to a maximum depth of 70 meters in the Gulf of Maine and on Georges Bank, and includes bays and estuaries within this geographic range where eggs were identified as "common" or "abundant" by the ELMR program. Depth is relative to mean low water. In coastal waters, the geographic extent of EFH for the eggs is based on the geographic range of the adults and, south of Cape Cod, the maximum depth where eggs have been observed on the bottom, and on Georges Bank and in the Gulf of Maine, the reported maximum depth for spawning adults on Georges Bank. Survey data in support of the southern limit of EFH are provided in Appendix I.

The 5 meter depth area begins at the tip of Cape Cod at Provincetown, Massachusetts, and includes waters along the eastern and southern sides of the Cape, south to New Jersey. The maximum egg depth in southern New England and the Mid-Atlantic is the same as in the no action designation for the entire coast. It was not changed because data collected during a series of benthic winter flounder egg surveys by the U.S. Army Corps of Engineers in the New York Harbor area in recent years indicate that many more eggs are deposited on the bottom in shallow water areas, not in the deeper shipping channels (Wilber et al. 2013). Based on this information, the Council concluded that the shoal water areas in New York harbor were the primary habitat

[27] Note that 20 meters is actually shown on the map due to the difficulty of depicting a 5 meter depth contour on a regional scale map. However, only areas where the depth is 5 meters or less are actually part of the designation.

for winter flounder eggs. Other information summarized by Pereira et al. (1999) and reported in Schultz et al. (2007) also indicates that winter flounder in Long Island Sound and Rhode Island spawn in shallow coastal water. Because there was no available information indicating that winter flounder in southern New England or in New Jersey spawn in deeper water, the depth range for egg EFH is the same as in the status quo designation.

The 70 meter maximum depth applies along the entire coast of the Gulf of Maine as far south as Cape Cod Bay. Evidence from recent research studies in the southwestern Gulf of Maine (DeCelles and Cadrin 2010, Fairchild et al. 2013) show that winter flounder spawn in deeper water as well as in coastal estuaries. Based on this information, the Council decided to extend EFH for winter flounder eggs to 70 meters north of Cape Cod and on Georges Bank. Seventy meters is the maximum depth identified in the original edition of Fishes of the Gulf of Maine for spawning winter flounder on Georges Bank (Bigelow and Schroeder 1953).

The EFH text description for winter flounder eggs adds submerged aquatic vegetation to the list of egg substrates and, as is the case for all the proposed new descriptions, does not include any reference to temperature, salinity, or spawning seasons. Supplementary EFH information for all four life stages can be found in Appendix B.

The preferred EFH text description for juvenile winter flounder refers to a greater variety of bottom types than the status quo description (which was limited to "mud or fine-grained sand"), including rocky substrates with attached vegetation, tidal wetlands, eelgrass, and for young-of-the-year juveniles, bottom debris and marsh creeks. Unlike the status quo designations, the preferred designation for juveniles now includes the intertidal zone. Hard bottom habitats are also added to the proposed EFH text description for adults. As preferred, EFH for juveniles and adults would extend specifically to maximum depths of 60 and 70 meters, respectively, compared to "generally" 50 and 100 meters.

The preferred maps for juveniles and adults are largely based on trawl survey catch data (numbers per tow). The EFH map for larvae and adults is the same, although the larvae are pelagic and the actual extent of EFH for each life stage within the area that is mapped is subject to the habitat requirements provided in Appendix B. Specifically, the maps are based on the distributions of depths and bottom temperatures that were associated with high catch rates of juveniles and adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. The maps are also based on average catch rates in ten minute squares of latitude and longitude for juveniles and adults in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level. They also include inshore areas north of Absecon Inlet where juvenile or adult winter flounder were caught in 10% or more of the tows made in individual ten minute squares in state trawl surveys, as well as the ELMR information shown in Table 24. Additional un-surveyed ten minute squares were filled in along the Maine, New Hampshire, and Connecticut coasts and east of Nantucket Island (see Map 9 in Appendix A).

There are significant differences between the preferred and no action maps. Because the no action EFH maps are all based on the distribution of adults, they are all the same. However, because the maximum depth for egg EFH south of Cape Cod is still 5 meters, the real change in the designation occurs in the Gulf of Maine and on Georges Bank due to the increase from 5 to

70 meters, and in southern New Jersey, which is no longer potential EFH area for any life stage. For larvae, juveniles, and adults, the deepest parts of the Great South Channel are no longer designated as they exceed the maximum depth limits, particularly for juveniles. However, there are additional areas of EFH for all three life stages towards the edge of the continental shelf and on Georges Bank relative to the no action map. The minimum latitude for all winter flounder EFH designations was defined as 39° 22" N, approximately the entrance to Absecon Inlet near Atlantic City, NJ. The no action map included some ten minute squares south of this boundary, inland bays in southern New Jersey, Delaware Bay, and Chincoteague Bay.

Text descriptions:

Essential fish habitat for winter flounder (*Pseudopleuronectes americanus*) is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 24 that meet the conditions described below.

Eggs: Sub-tidal estuarine and coastal benthic habitats from mean low water to 5 meters from Cape Cod to Absecon Inlet (39° 22' N), and as deep as 70 meters on Georges Bank and in the Gulf of Maine (see Map 63), including mixed and high salinity zones in the bays and estuaries listed in Table 24. The eggs are adhesive and deposited in clusters on the bottom. Essential habitats for winter flounder eggs include mud, muddy sand, sand, gravel, macroalgae, and submerged aquatic vegetation. Bottom habitats are unsuitable if exposed to excessive sedimentation which can reduce hatching success.

Larvae: Estuarine, coastal, and continental shelf water column habitats from the shoreline to a maximum depth of 70 meters from the Gulf of Maine to Absecon Inlet (39° 22' N), and including Georges Bank, as shown on Map 65, including mixed and high salinity zones in the bays and estuaries listed in Table 24. Larvae hatch in nearshore waters and estuaries or are transported shoreward from offshore spawning sites where they metamorphose and settle to the bottom as juveniles. They are initially planktonic, but become increasingly less buoyant and occupy the lower water column as they get older.

Juveniles: Estuarine, coastal, and continental shelf benthic habitats from the Gulf of Maine to Absecon Inlet (39° 22' N), and including Georges Bank, as shown on Map 64, and in mixed and high salinity zones in the bays and estuaries listed in Table 24. Essential fish habitat for juvenile winter flounder extends from the intertidal zone (mean high water) to a maximum depth of 60 meters and occurs on a variety of bottom types, such as mud, sand, rocky substrates with attached macroalgae, tidal wetlands, and eelgrass. Young-of-the-year juveniles are found inshore on muddy and sandy sediments in and adjacent to eelgrass and macroalgae, in bottom debris, and in marsh creeks. They tend to settle to the bottom in soft-sediment depositional areas where currents concentrate late-stage larvae and disperse into coarser-grained substrates as they get older.

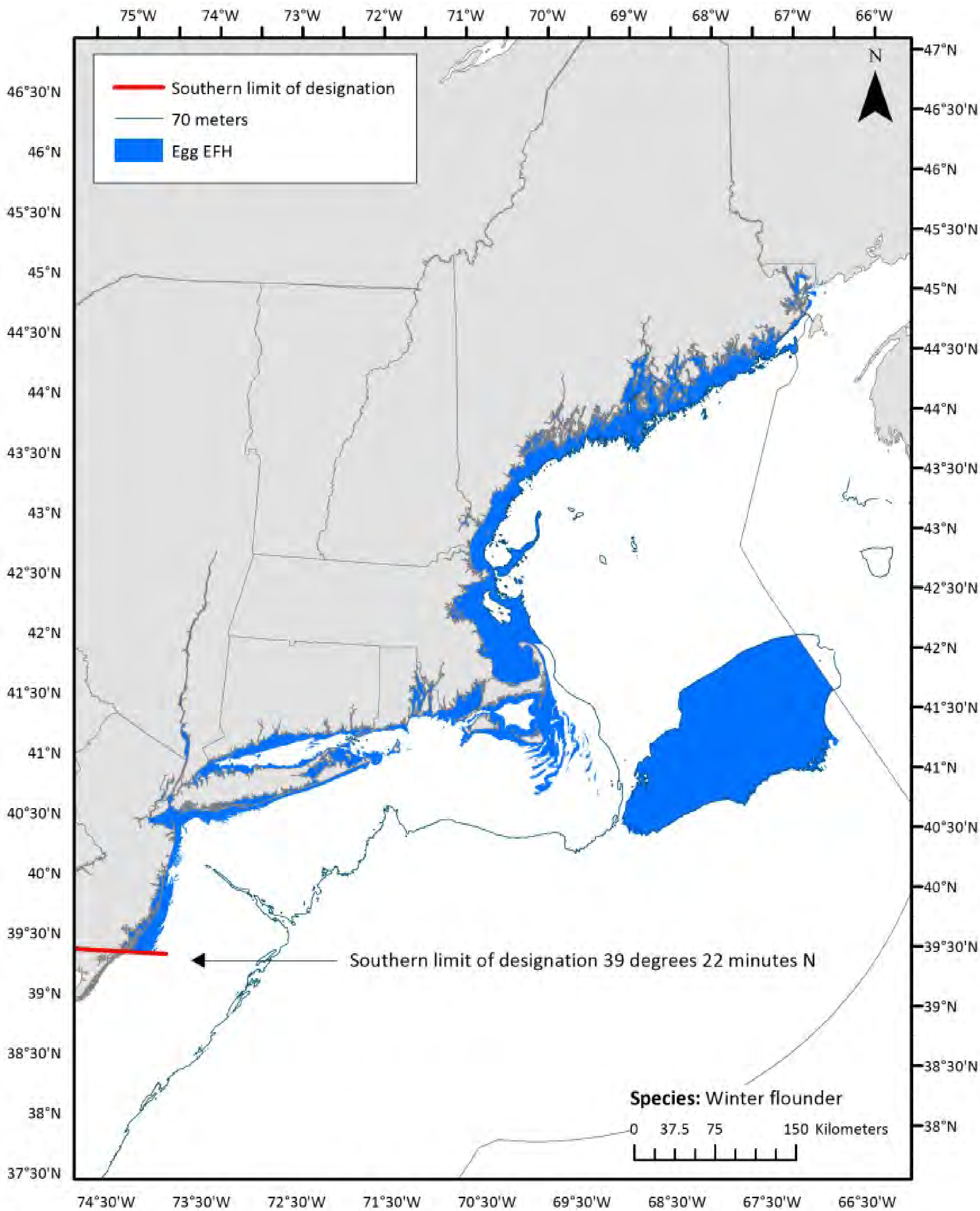
Adults: Estuarine, coastal, and continental shelf benthic habitats extending from the intertidal zone (mean high water) to a maximum depth of 70 meters from the Gulf of Maine to Absecon Inlet (39° 22' N), and including Georges Bank, as shown on Map 65, and in mixed and high salinity zones in the bays and estuaries listed in Table 24. Essential fish habitat for adult winter flounder occurs on muddy and sandy substrates, and on hard bottom on offshore banks. In inshore spawning areas, essential fish habitat includes a variety of substrates where eggs are deposited on the bottom (see eggs).

Table 24 – Winter flounder EFH designation for estuaries and embayments.

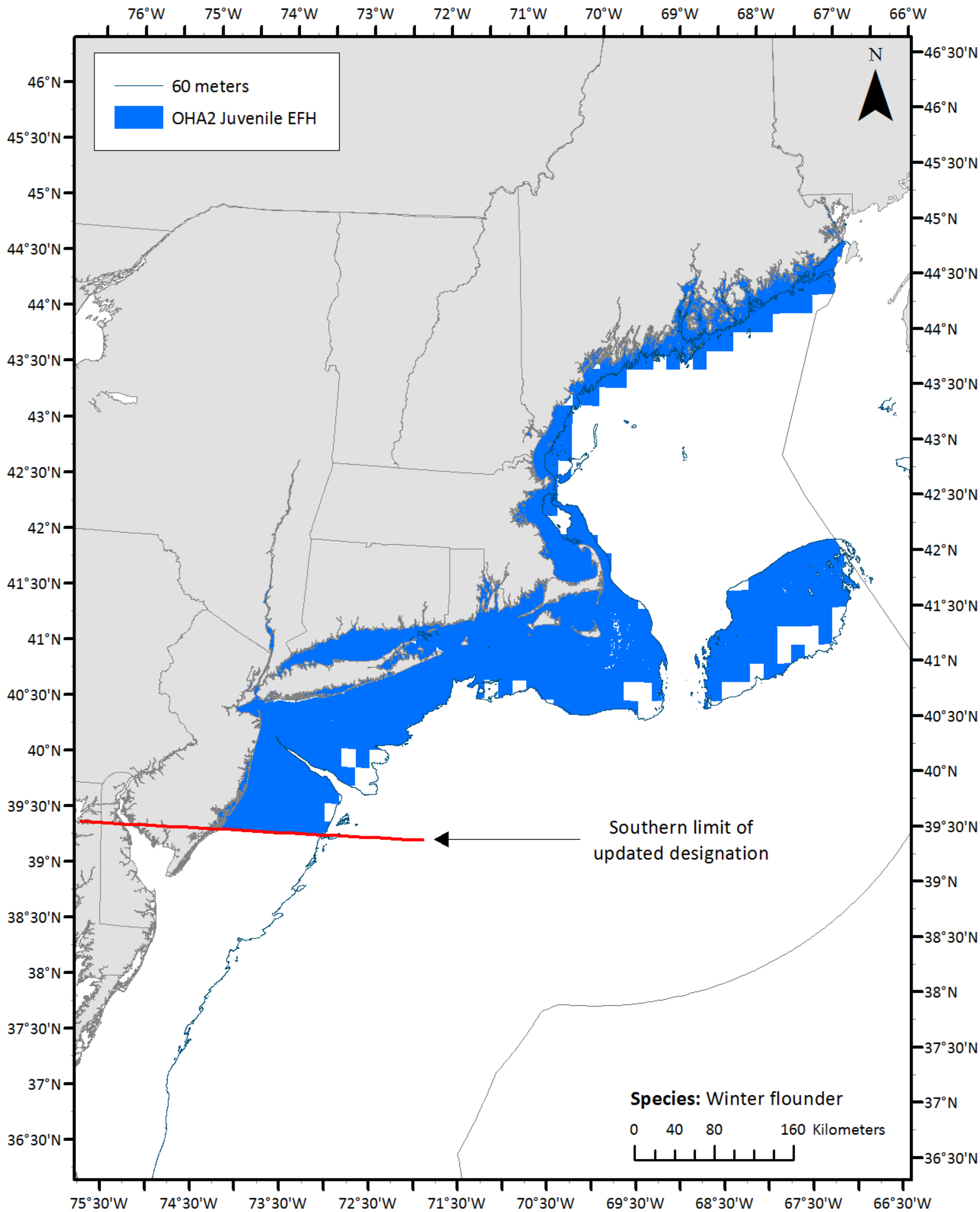
Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults
Passamaquoddy Bay	S,M	S,M	S,M	S,M
Englishman/Machias Bay	S,M	S,M	S,M	S,M
Narraguagus Bay	S,M	S,M	S,M	S,M
Blue Hill Bay	S,M	S,M	S,M	S,M
Penobscot Bay	S,M	S,M	S,M	S,M
Muscongus Bay	S,M	S,M	S,M	S,M
Damariscotta River	S,M	S,M	S,M	S,M
Sheepscot River	S,M	S,M	S,M	S,M
Kennebec / Androscoggin	S,M	S,M	S,M	S,M
Casco Bay	S,M	S,M	S,M	S,M
Saco Bay	S,M	S,M	S,M	S,M
Wells Harbor	S,M	S,M	S,M	S,M
Great Bay	S,M	S,M	S,M	S,M
Hampton Harbor*	S,M	S,M	S,M	S,M
Merrimack River	M	M	M	M
Plum Island Sound*	S,M	S,M	S,M	S,M
Massachusetts Bay	S	S	S	S
Boston Harbor	S,M	S,M	S,M	S,M
Cape Cod Bay	S,M	S,M	S,M	S,M
Waquoit Bay	S,M	S,M	S,M	S,M
Buzzards Bay	S,M	S,M	S,M	S,M
Narragansett Bay	S,M	S,M	S,M	S,M
Long Island Sound	S,M	S,M	S,M	S,M
Connecticut River	M	M	M	M
Gardiners Bay	S,M	S,M	S,M	S,M
Great South Bay	S,M	S,M	S,M	S,M
Hudson River / Raritan Bay	S,M	S,M	S,M	S,M
Barnegat Bay	S,M	S,M	S,M	S,M
New Jersey Inland Bays**	S,M	S,M	S,M	S,M

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).
** = This water body was not included in the original ELMR reports, but it was included in the salinity zone maps that were appended to all the relevant fishery management plans and amendments which implemented the no action EFH designations; EFH designations were inferred in these locations if there were ELMR-based designations in the adjacent north and south locations.*
*** EFH is only designated within NJ inland bays north of 39° 22′ N.*

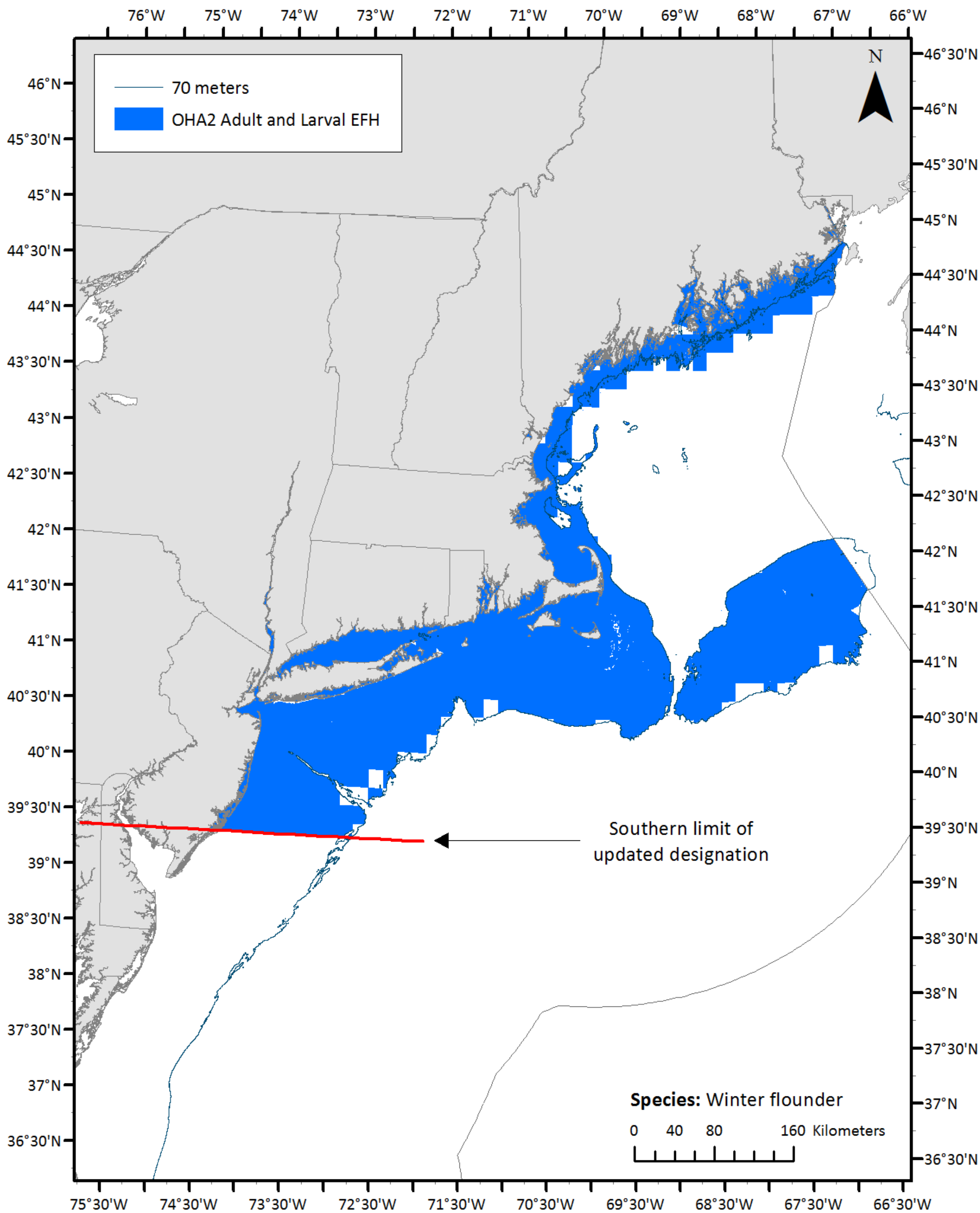
Map 63 – Winter flounder egg EFH.



Map 64 – Winter flounder juvenile EFH.



Map 65 – Winter flounder larval and adult EFH.



2.2.1.12 Witch flounder

No new region-wide ichthyoplankton surveys have been conducted since the MARMAP egg and larval surveys were conducted in 1977-1987. Therefore, the proposed EFH maps for witch flounder eggs and larvae are based on the same data (100% of the ten minute squares where witch flounder eggs and larvae were collected in the MARMAP surveys) as the no action EFH maps, but any "filled in" ten minute squares were removed (see explanation of original mapping methodology in Appendix A). There is no ELMR information for any of the four life stages of witch flounder.

The proposed EFH maps for juvenile and adult witch flounder are based on the distribution of depths and bottom temperatures that were associated with high catch rates of juveniles or adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. The maps are also based on average catch rates for each life stage in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level, and they include inshore areas where juvenile or adult witch flounder were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys, and a depth and geographic range on the continental slope where they were determined to be present (see Appendix A).

The no action designations for the juveniles and adults are restricted to the Gulf of Maine and the outer continental shelf, whereas the proposed designations include the continental slope down to 1500 meters. The proposed designations define minimum depths of 80 and 100 meters for juveniles and adults, respectively, on the shelf (but not in the Gulf of Maine) whereas the no action designations refer to minimum depths of 50 and 25 meters throughout the range of the species. As proposed, EFH for witch flounder would extend into deeper water than for any of other finfish species managed by the New England Council.[28] EFH on the slope is more continuous along the outer shelf and slope in the proposed maps than in the no action maps, especially for the adults. For both life stages, the Gulf of Maine is a prominent feature in the no action and in the new proposed maps. There is very little difference between the modified and the approved EFH maps for juvenile witch flounder; use of adult survey data – instead of juvenile data – to map the extent of EFH for the adults (the modified designation) "filled in" the outer Gulf of Maine almost completely, otherwise it had very little effect.

Text descriptions:

Essential fish habitat for witch flounder (*Glyptocephalus cynoglossus*) is designated anywhere within the geographic areas that are shown on the following maps and meets the conditions described below.

Eggs and Larvae: Pelagic habitats on the continental shelf throughout the Northeast region, as shown on Map 66 and Map 67.

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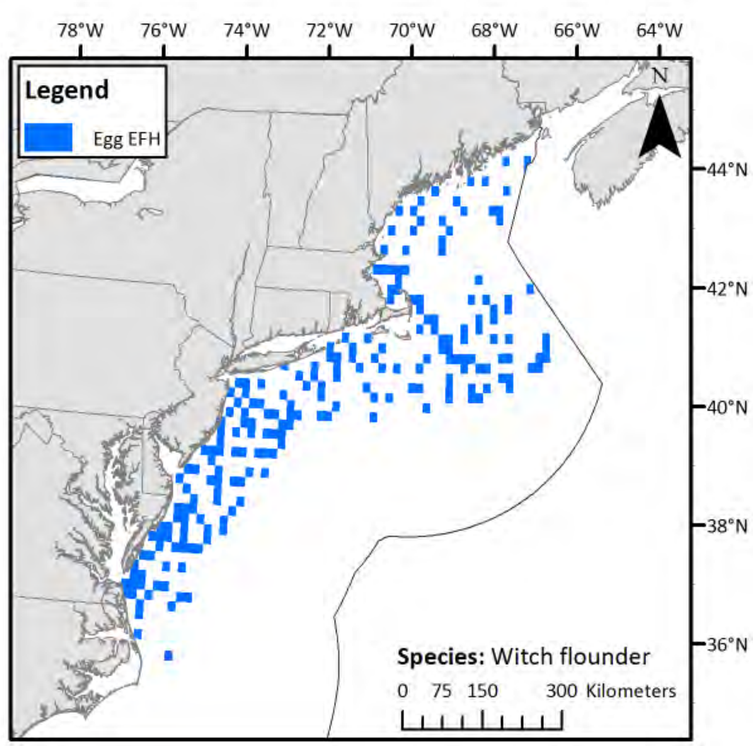
[28] Also, in the status quo adult designation, the maximum depth is 300 meters and no reference is made to the 1500 meter depth that is mentioned in the juvenile text description. The proposed maximum depth for deep-sea red crabs is 2000 meters.

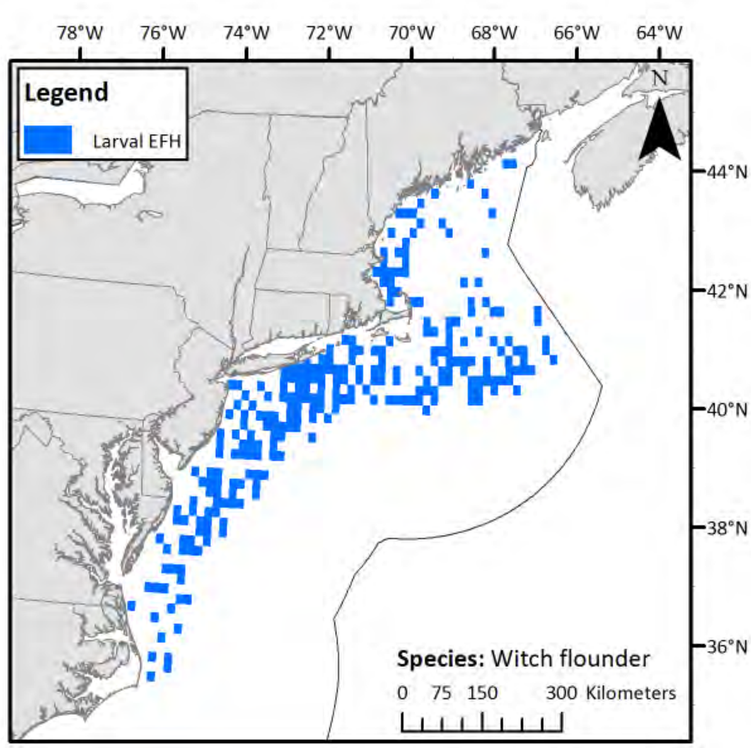
Juveniles: Sub-tidal benthic habitats between 50 and 400 meters in the Gulf of Maine and as deep as 1500 meters on the outer continental shelf and slope, with mud and muddy sand substrates, as shown on Map 68.

Adults: Sub-tidal benthic habitats between 35 and 400 meters in the Gulf of Maine and as deep as 1500 meters on the outer continental shelf and slope, with mud and muddy sand substrates, as shown on Map 69.

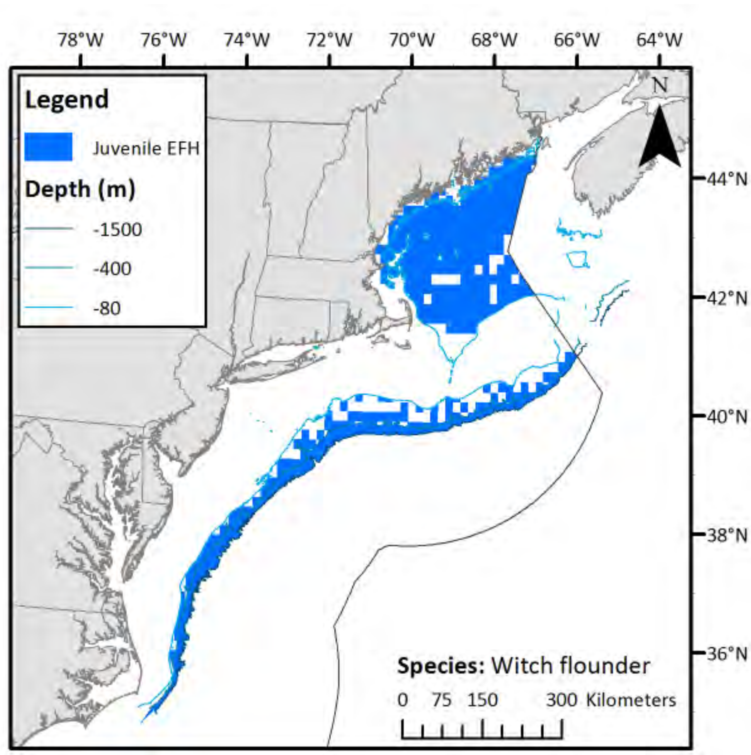
Map 66 – Witch flounder egg EFH.



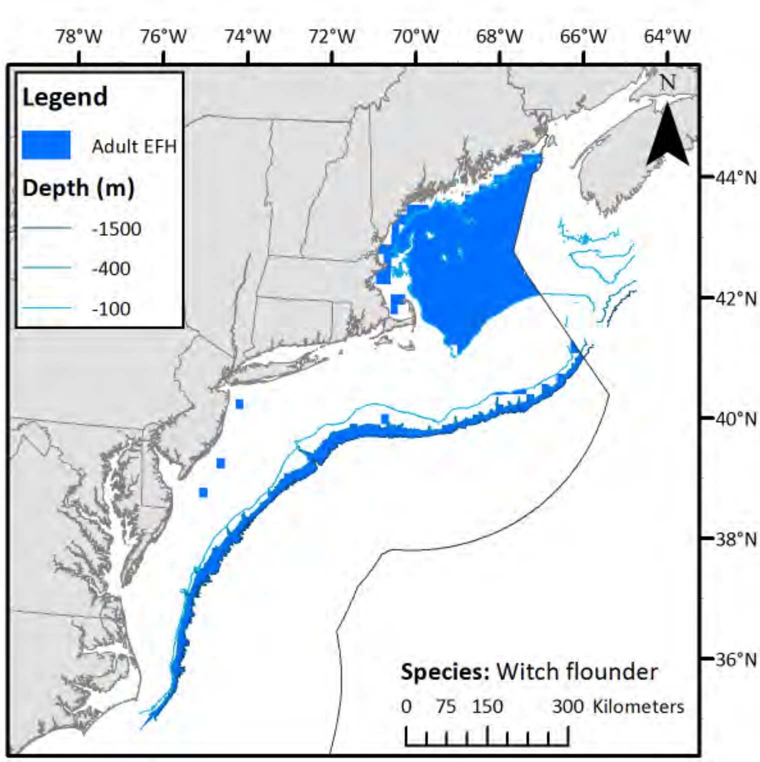
Map 67 – Witch flounder larval EFH.



Map 68 – Witch flounder juvenile EFH.



Map 69 – Witch flounder adult EFH.



2.2.1.13 Yellowtail flounder

No new region-wide ichthyoplankton surveys have been conducted since the MARMAP egg and larval surveys were conducted in 1977-1987. Therefore, the proposed EFH maps for yellowtail flounder eggs and larvae are based on the same data (100% of the ten minute squares where yellowtail eggs and larvae were collected in the MARMAP surveys) as the no action EFH maps, but any “filled in” ten minute squares were removed (see explanation of original mapping methodology in Appendix A). In addition, the proposed designations – like the no action designations – include those bays and estuaries identified in the ELMR program as supporting yellowtail flounder eggs or larvae at the "common" or "abundant" level.

The proposed EFH maps for juvenile and adult yellowtail flounder are based on the distribution of depths and bottom temperatures that were associated with high catch rates of juveniles or adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. They are also based on average catch per tow data in ten minute squares of latitude and longitude for juveniles and adults in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level and include inshore areas where juvenile or adult yellowtail flounder were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys, and ELMR information. These designations are 3D alternatives in the Phase 1 DEIS.

The no action text descriptions for the juveniles and adults are identical and define a depth range of 20-50 meters, whereas EFH in the proposed designations would extend to 80 (juveniles) and 90 (adults) meters. The geographical extent of EFH in the proposed and the no action maps for the juveniles and adults is very similar, although a number of ten minute squares have been added along the Maine and New Jersey coasts and south of Cape Cod. State survey data were mistakenly left out of the EFH maps that were approved in 2007; including these survey data added quite a few new ten minute squares to both maps. A re-analysis of the survey catch data as it related to depth resulted in an expansion of the depth ranges that were used to map EFH on the shelf and, therefore, increased the amount of EFH on the continental shelf.

Text descriptions:

Essential fish habitat for yellowtail flounder (*Limanda ferruginea*) is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 25 and meets the conditions described below.

Eggs: Coastal and continental shelf pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region as far south as the upper Delmarva peninsula, as shown on Map 70, including the high salinity zones of the bays and estuaries listed in Table 25.

Larvae: Coastal marine and continental shelf pelagic habitats in the Gulf of Maine, and from Georges Bank to Cape Hatteras, as shown on Map 71, including the high salinity zones of the bays and estuaries listed in Table 25.

Juveniles: Sub-tidal benthic habitats in coastal waters in the Gulf of Maine and on the continental shelf on Georges Bank and in the Mid-Atlantic as shown on Map 72, including the high salinity zones of the bays and estuaries listed in Table 25. Essential fish habitat for juvenile yellowtail flounder occurs on sand and muddy sand between 20 and 80 meters. In the Mid-Atlantic, young-of-the-year juveniles settle to the bottom on the continental shelf, primarily at depths of 40-70 meters, on sandy substrates.

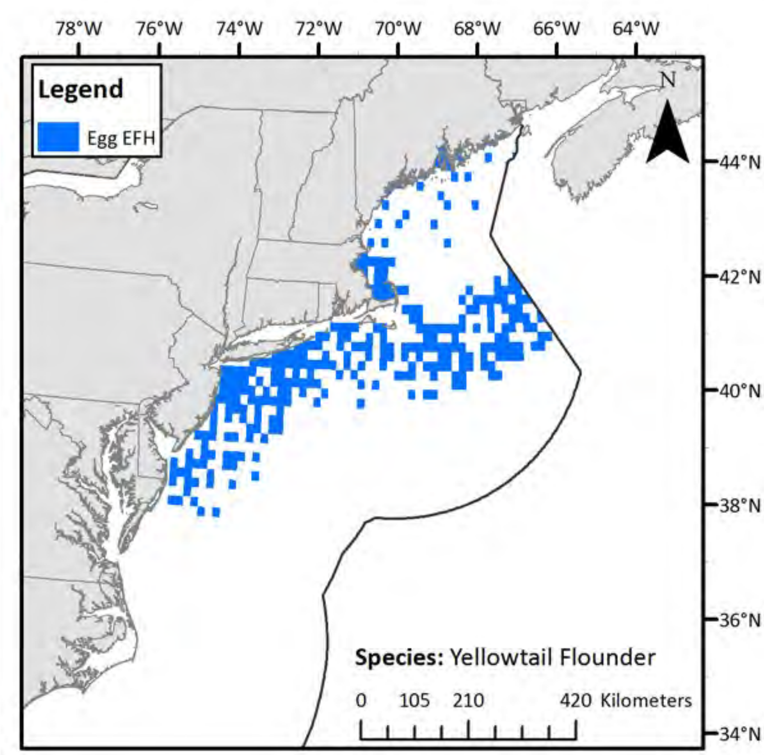
Adults: Sub-tidal benthic habitats in coastal waters in the Gulf of Maine and on the continental shelf on Georges Bank and in the Mid-Atlantic as shown on Map 73, including the high salinity zones of the bays and estuaries listed in Table 25. Essential fish habitat for adult yellowtail flounder occurs on sand and sand with mud, shell hash, gravel, and rocks at depths between 25 and 90 meters.

Table 25 – Yellowtail flounder EFH designation for estuaries and embayments.

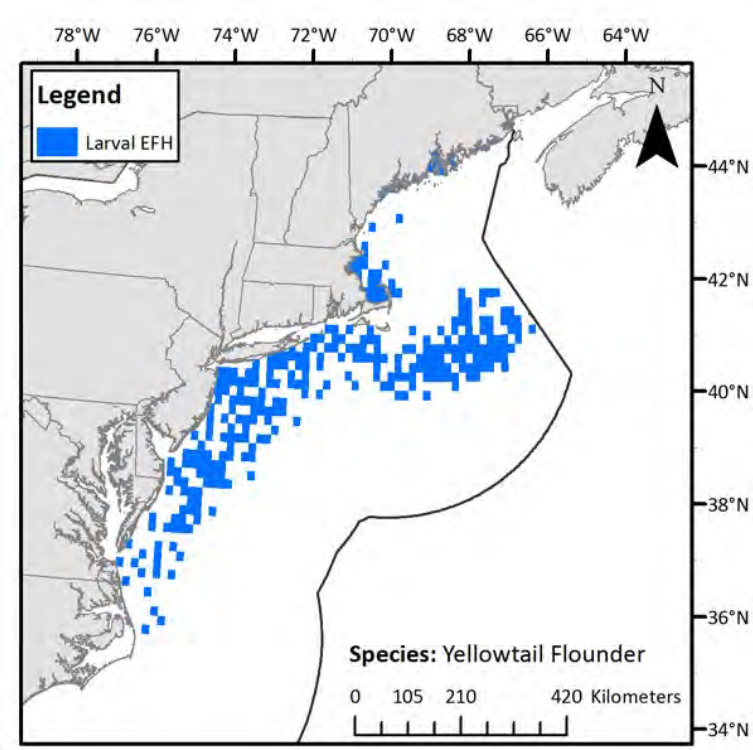
Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults
Sheepscot River			S	S
Casco Bay	S	S	S	S
Massachusetts Bay	S	S	S	S
Boston Harbor	S	S	S	S
Cape Cod Bay	S	S	S	S

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).

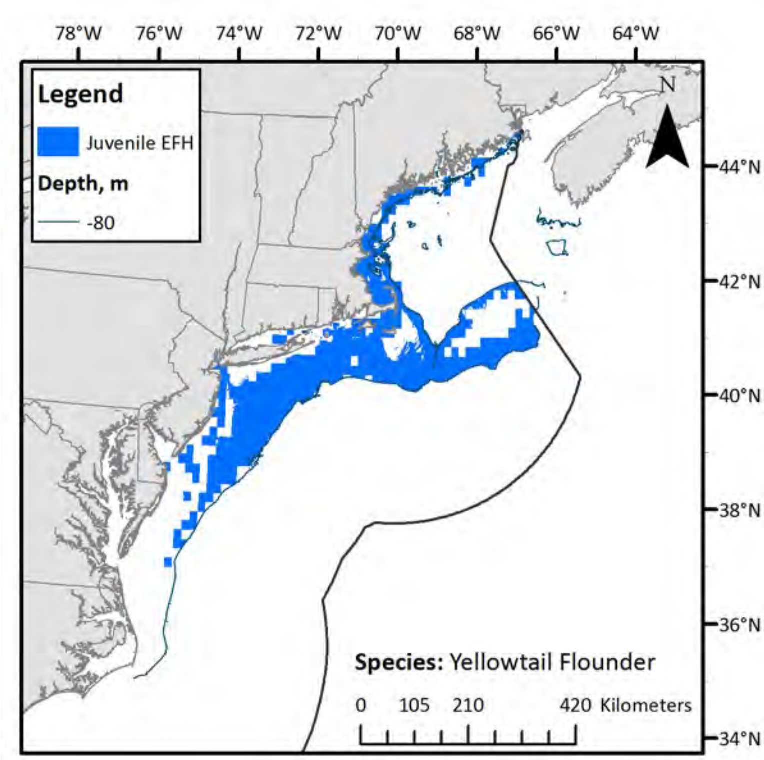
Map 70 – Yellowtail flounder egg EFH.



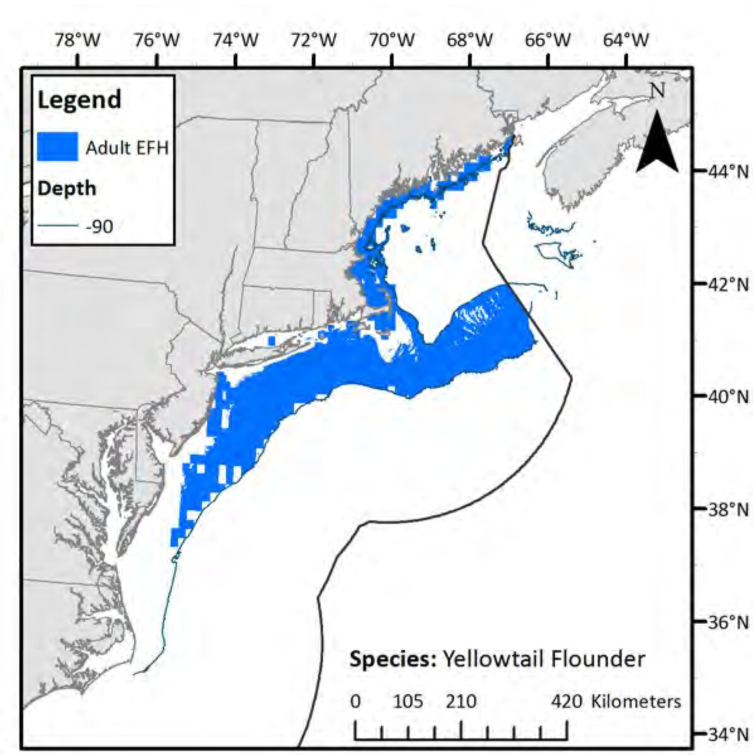
Map 71 – Yellowtail flounder larval EFH.



Map 72 – Yellowtail flounder juvenile EFH.



Map 73 – Yellowtail flounder adult EFH.



2.2.2 Northeast multispecies (groundfish) – small mesh species

2.2.2.1 Silver hake

The proposed EFH map for silver hake eggs and larvae is based upon the average catch per tow of juvenile silver hake in ten minute squares of latitude and longitude during 1968-2005 in the fall and spring NMFS trawl surveys at the 90th percentile of catch level. This alternative also includes ten minute squares in inshore areas where juvenile silver hake were caught in state trawl surveys in 10% or more of the tows made in each square, and bays and estuaries identified by the ELMR program where silver hake eggs and larvae were "common" or "abundant." This designation was referred to as Alternative 2D in the Phase 1 DEIS. The proposed egg and larval map, like the no action map, includes nearly all the Gulf of Maine, but it covers less area on Georges Bank and in the Mid-Atlantic and does not extend south of Delaware Bay. The proposed map includes nearshore waters in the Gulf of Maine and off New Jersey that were not included in the original 1998 map.

The proposed EFH maps for juvenile and adult silver hake are based on the distributions of depths and bottom temperatures that were either associated with high catch rates of juveniles and adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. They are also based on average catch per tow data for juveniles and adults in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 75th percentile of catch level, and they include inshore areas where juvenile or adult silver hake were caught in 10% or more of the tows made in individual ten minute squares during state trawl surveys and ELMR information north of Cape Cod. The proposed juvenile and adult designations were referred to as 3C alternatives in the Phase 1 DEIS.[29] Juvenile silver hake occupy distinct depth ranges in the spring (140-400 m) and fall (40-100 m). Since it is assumed the species is transitioning between these depth zones between these two seasons, the proposed EFH map within the NEFSC survey area is based on the union of spring and fall depth data layers, i.e. relative abundance data are clipped shallower than 40 m and deeper than 400 m. That is, in the proposed juvenile map, as modified by the Habitat Committee in 2011, depths between 100 and 140 are filled in.

The proposed EFH map for juvenile silver hake includes less area on Georges Bank and in the Mid-Atlantic than the no action map. There is a high degree of coverage in the Gulf of Maine in both maps, although the proposed map excludes the 30-40 meter depth range and includes all the nearshore area. The proposed designation would also cause a shift in EFH from the mid-shelf to the inner shelf area off New Jersey and eliminate EFH in nearshore waters south of Long Island. The proposed and no action EFH maps for adult silver hake are similar, however, small amounts of EFH area have been added in Long Island Sound, in Narragansett Bay and coastal waters south of Cape Cod, and off northern New Jersey and Cape May. There is also a large area in deep water southeast of Long Island that is only partially included in the no action map. The proposed juvenile and adult text descriptions refer to benthic and pelagic habitats, not just bottom habitats, and specify substrate types instead of defining EFH as occurring on "all" substrates.

[29] The 3C juvenile silver hake in the DEIS was not done correctly: it should have included deep water basins in the Gulf of Maine that were within the maximum depth for this species (400 m).

Modifications to the approved juvenile EFH alternative did not involve any change in depth ranges, but did substantially expand the fall bottom temperature ranges used in the map. An increase from 10.5 to 18.5˚C caused a number of ten minute squares on Georges Bank and in the Mid-Atlantic to be added to the map. It is not clear what changes occurred in the Gulf of Maine since the approved map in the DEIS was not correct (see footnote 24). The modified adult EFH map includes new areas in the Gulf of Maine and on the inner and outer continental shelf between 70 and 120 meters that were not mapped in 2007 when the depth range was 120-400.

Text descriptions:

Essential fish habitat for silver hake (*Merluccius bilinearis*) is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 26 and meets the conditions described below.

Eggs and Larvae: Pelagic habitats from the Gulf of Maine to Cape May, New Jersey, including Cape Cod and Massachusetts Bays (see Map 74 and Table 26).

Juveniles: Pelagic and benthic habitats in the Gulf of Maine, including the coastal bays and estuaries listed in Table 26, and on the continental shelf as far south as Cape May, New Jersey, at depths greater than 10 meters in coastal waters in the Mid-Atlantic and between 40 and 400 meters in the Gulf of Maine, on Georges Bank, and in the middle continental shelf in the Mid-Atlantic, on sandy substrates (see Map 75). Juvenile silver hake are found in association with sand-waves, flat sand with amphipod tubes, and shells, and in biogenic depressions. Juveniles in the New York Bight settle to the bottom at mid-shelf depths on muddy sand substrates and find refuge in amphipod tube mats.

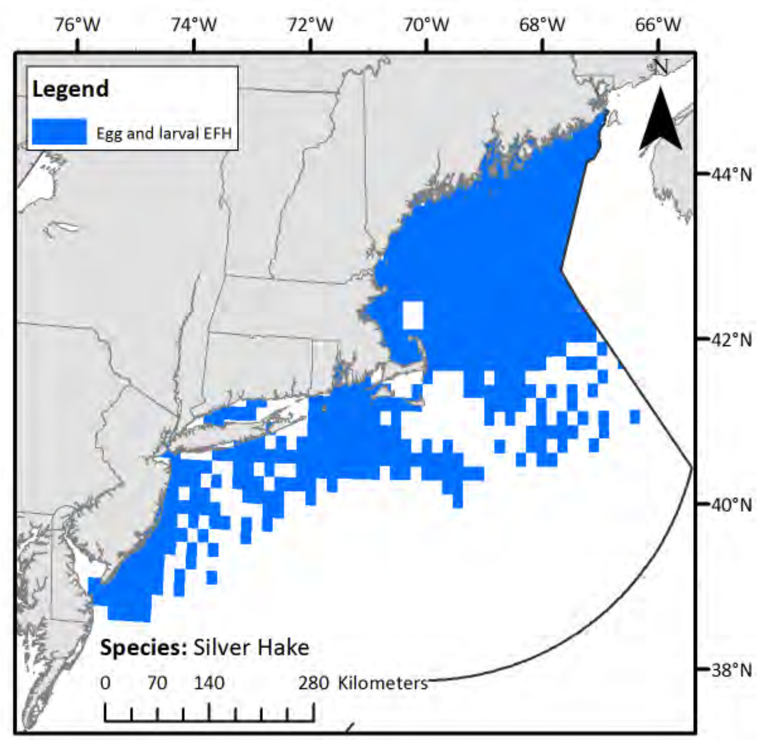
Adults: Pelagic and benthic habitats at depths greater than 35 meters in the Gulf of Maine and the coastal bays and estuaries listed in Table 26, between 70 and 400 meters on Georges Bank and the outer continental shelf in the northern portion of the Mid-Atlantic Bight, and in some shallower locations nearer the coast, on sandy substrates (see Map 76). Adult silver hake are often found in bottom depressions or in association with sand waves and shell fragments. They have also been observed at high densities in mud habitats bordering deep boulder reefs, resting on boulder surfaces, and foraging over deep boulder reefs in the southwestern Gulf of Maine. This species makes greater use of the water column (for feeding, at night) than red or white hake.

Table 26 – Silver hake EFH designation in estuaries and embayments

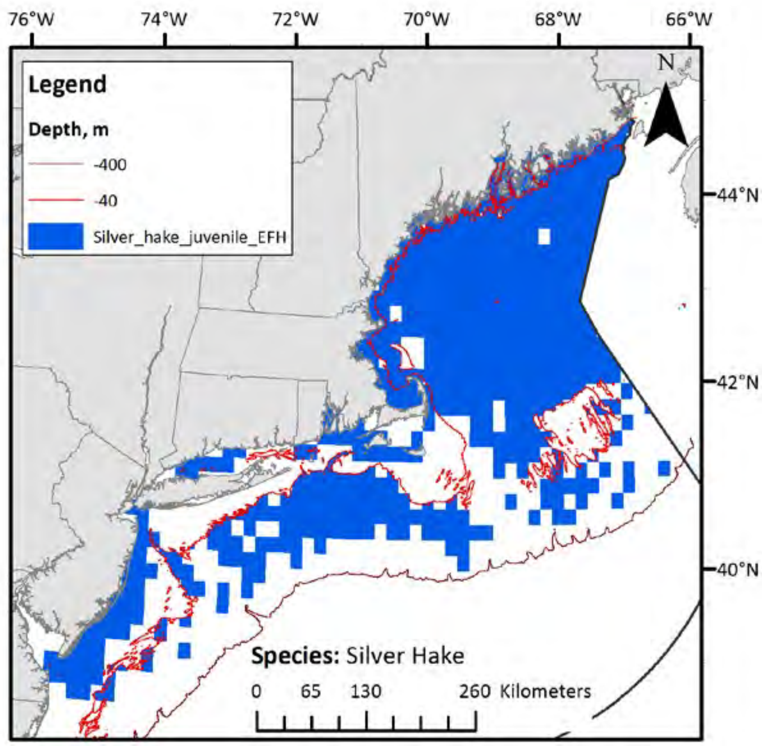
Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults
Passamaquoddy Bay			S,M	S,M
Englishman/Machias Bay			S,M	S,M
Narraguagus Bay			S,M	S,M
Blue Hill Bay			S,M	S,M
Penobscot Bay			S,M	S,M
Muscongus Bay			S,M	S,M
Damariscotta River			S,M	S,M
Sheepscot River			S,M	S,M
Kennebec / Androscoggin			S,M	S,M
Casco Bay	S	S	S,M	S,M
Saco Bay			S,M	S,M
Merrimack River	M			
Massachusetts Bay	S	S	S	S
Boston Harbor	S	S	S,M	S,M
Cape Cod Bay	S	S	S,M	S,M

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).

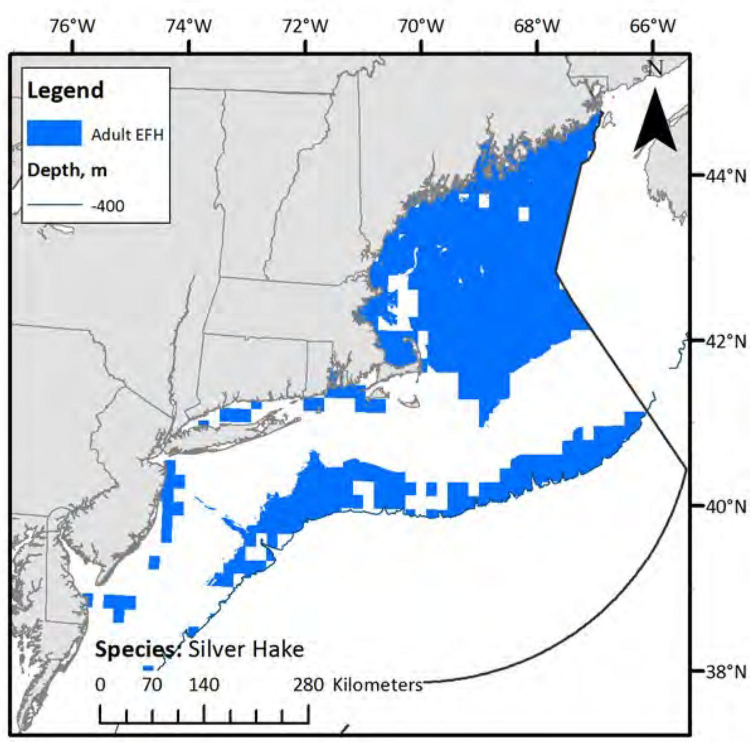
Map 74 – Silver hake egg and larval EFH.



Map 75 – Silver hake juvenile EFH.



Map 76 – Silver hake adult EFH.



2.2.2.2 Red hake

The proposed EFH map for red hake eggs, larvae, and juveniles is based on the distributions of depths and bottom temperatures that are associated with high catch rates of juveniles in the 1963-2003 spring and fall NMFS trawl surveys.[30] This designation is also based on average catch rates of juveniles in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 75th percentile of catch level, includes inshore areas where juvenile red hake were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys and ELMR areas for eggs, larvae, and juveniles. This was Alternative 3C in the Phase 1 DEIS.

The proposed EFH map for adults was created in the same way, except that the 1968-2005 trawl survey data were mapped at the 90th percentile and the map includes the continental slope down to 750 meters, the reported maximum depth for adult red hake in the Northeast region (Alternative 3D in the Phase 1 DEIS).

Compared to the no action EFH descriptions, the proposed juvenile text description refers to estuarine and coastal marine benthic habitats, including the intertidal zone, not just the continental shelf, and to a much wider variety of substrates for young-of-the-year and older juveniles than the no action description. The proposed adult EFH designation defines a much broader depth range than the no action designation and extends EFH on to the continental slope to a depth of 750 meters.

The proposed EFH map for red hake eggs, larvae, and juveniles covers roughly the same geographic area as the individual no action maps for these three life stages, but with some added detail – notably a considerable amount of non-EFH area at intermediate depths and in deep water (>80 m) on the continental shelf, in shallow water on Georges Bank, and in the outer Gulf of Maine. The proposed EFH map for adults is very similar to the no action map. As is true for other species, EFH would be defined more realistically in the proposed designations because of the use of level 2 depth information (50-300 meters for adults) on the shelf, rather than only relying on survey data binned into ten minute squares.

When the designations that were approved in 2007 were modified by the Habitat Committee in 2011, annual depth ranges replaced seasonal depth ranges for this species. This caused the gap between 30 m (the maximum depth in the spring) and 40 m (the maximum depth in the fall) to be filled in. In the modified adult map, the gap between 300 m (the maximum annual depth as defined by Level 2 survey data on the shelf) and 400 m (the minimum annual depth of the Level 1 continental slope spatial area) was filled in.

Text descriptions:

[30] Red hake eggs and larvae were not differentiated from eggs and larvae of white, spotted and longfin hake in all of the 1978-1987 MARMAP survey collections. In the original (status quo) designations, the egg and larval maps were based on egg survey data for all four species plus juvenile trawl survey data and ELMR data. When the proposed new EFH maps were developed, no MARMAP data for either life stage were used.

Essential fish habitat for red hake (*Urophycis chuss*) is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 27 and meets the conditions described below.

Eggs and Larvae: Pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic, as shown on Map 77, and in the bays and estuaries listed in Table 27.

Juveniles: Intertidal and sub-tidal benthic habitats throughout the region on mud and sand substrates, to a maximum depth of 80 meters, as shown on Map 77, including the bays and estuaries listed in Table 27. Bottom habitats providing shelter are essential for juvenile red hake, including: mud substrates with biogenic depressions, substrates providing biogenic complexity (e.g., eelgrass, macroalgae, shells, anemone and polychaete tubes), and artificial reefs. Newly settled juveniles occur in depressions on the open seabed. Older juveniles are commonly associated with shelter or structure and often inside live bivalves.

Adults: Benthic habitats in the Gulf of Maine and the outer continental shelf and slope in depths of 50 – 750 meters (see Map 78) and as shallow as 20 meters in a number of inshore estuaries and embayments (see Table 27) as far south as Chesapeake Bay. Shell beds, soft sediments (mud and sand), and artificial reefs provide essential habitats for adult red hake. They are usually found in depressions in softer sediments or in shell beds and not on open sandy bottom. In the Gulf of Maine, they are much less common on gravel or hard bottom, but they are reported to be abundant on hard bottoms in temperate reef areas of Maryland and northern Virginia.

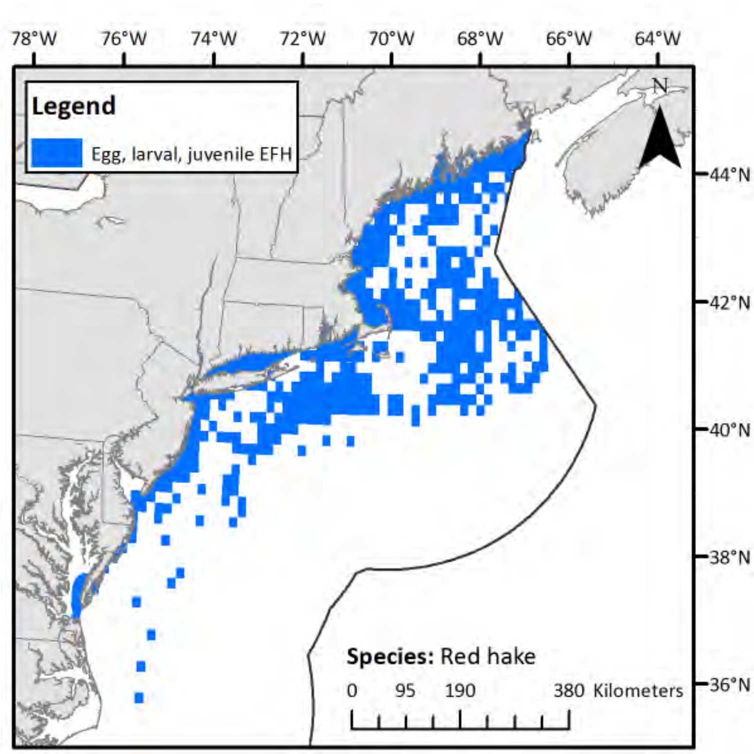
Table 27 – Red hake EFH designation for estuaries and embayments

Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults
Passamaquoddy Bay			S,M	S,M
Englishman/Machias Bay			S	S
Narraguagus Bay			S	S
Blue Hill Bay			S	S
Penobscot Bay			S,M	S,M
Muscongus Bay			S,M	S,M
Damariscotta River			S,M	S
Sheepscot River			S,M	S,M
Kennebec / Androscoggin			S,M	S,M
Casco Bay			S	S
Saco Bay			S	S
Great Bay		S	S	S
Hampton Harbor*			S	S
Merrimack River	M			
Plum Island Sound*			S	S
Massachusetts Bay	S	S	S	S
Boston Harbor	S	S	S,M	S,M
Cape Cod Bay		S	S,M	S,M
Buzzards Bay	S	S	S,M	S,M

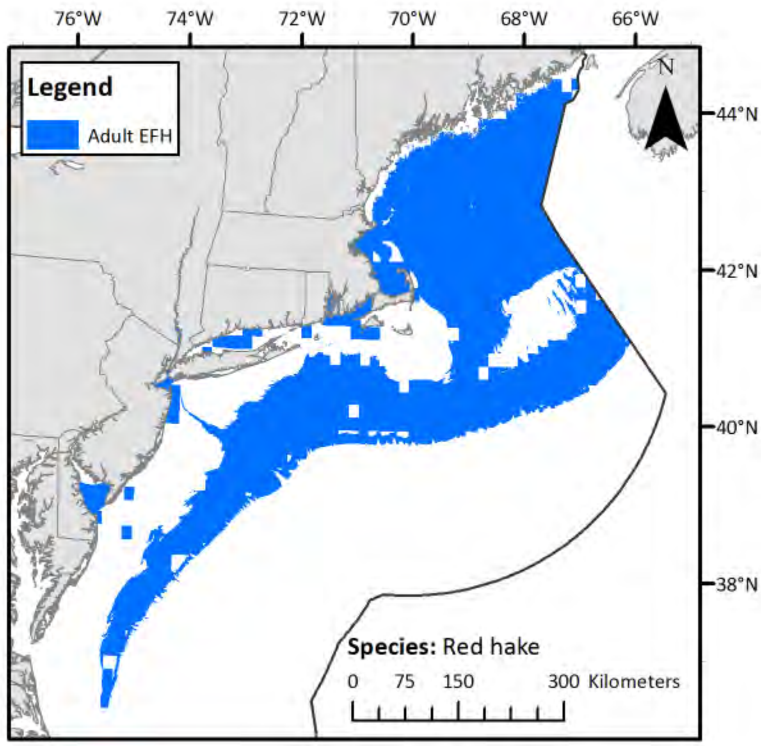
Narragansett Bay	S	S	S	S
Long Island Sound			S,M	S,M
Connecticut River			M	M
Hudson River / Raritan Bay		S,M	S,M	S,M
Delaware Bay				S
Chesapeake Bay			S	S

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).
** = This water body was not included in the original ELMR reports, but it was included in the salinity zone maps that were appended to all the relevant fishery management plans and amendments which implemented the no action EFH designations; EFH designations were inferred in these locations if there were ELMR-based designations in the adjacent north and south locations.*

Map 77 – Red hake egg, larval and juvenile EFH.



Map 78 – Red hake adult EFH.



2.2.2.3 Offshore hake

As in the original EFH designations, the proposed egg and larval EFH maps are based on the 75th percentile of the observed range of the MARMAP survey data. The continental slope was added to the proposed EFH text descriptions.

There is a single proposed EFH map for juvenile and adult offshore hake which is based on the distributions of depths and bottom temperatures that were associated with high catch rates of juveniles and adults in the 1963-2003 spring and fall NMFS trawl surveys and on the abundance of juveniles in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level, but excludes a couple of ten minute squares in the Gulf of Maine.[31] It also includes continental slope habitats that were defined using known maximum depth and geographic range information (see Table A-10). The range of this species extends to Florida and into the Gulf of Mexico in deep water, but EFH was not designated south of Cape Fear, North Carolina, because no survey data are available. The combined juvenile and adult designation was referred to as Alternative 5 (juvenile 3E and adult 3D) in the Phase 1 DEIS.

The proposed new map for juvenile and adult offshore hake defines EFH as a depth range along the outer continental shelf and slope rather than discrete ten minute squares. It also eliminates the few scattered ten minute squares in the Gulf of Maine that are in the no action map for

[31] Catch rates of adults in the spring and fall surveys during 1968-2005 were very low, so only the juvenile catch data were used in the map.

juveniles and extends EFH a little further south of Cape Hatteras. The proposed juvenile and adult offshore hake text descriptions define EFH as extending to 750 meters: the no action designations were limited to the continental shelf and identified 170-350 and 150-380 meters as depths where juveniles are adults "are found." The new designations also refer to pelagic and benthic habitats, reflecting the fact that the juveniles and adults of this species are not strictly demersal.

Text descriptions:

Essential fish habitat for offshore hake (*Merluccius albidus*) is designated anywhere within the geographic areas that are shown on the following maps and meets the conditions described below.

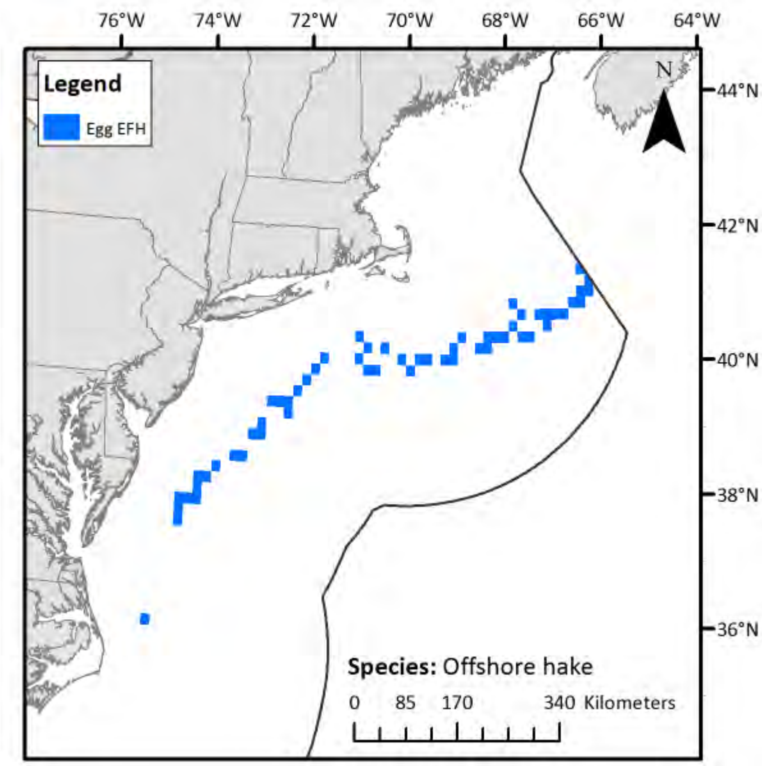
Eggs: Pelagic habitats along the outer continental shelf and slope between 100 and 1500 meters as shown on Map 79.

Larvae: Pelagic habitats along the outer continental shelf and slope between 60 and 1500 meters as shown on Map 80**.**

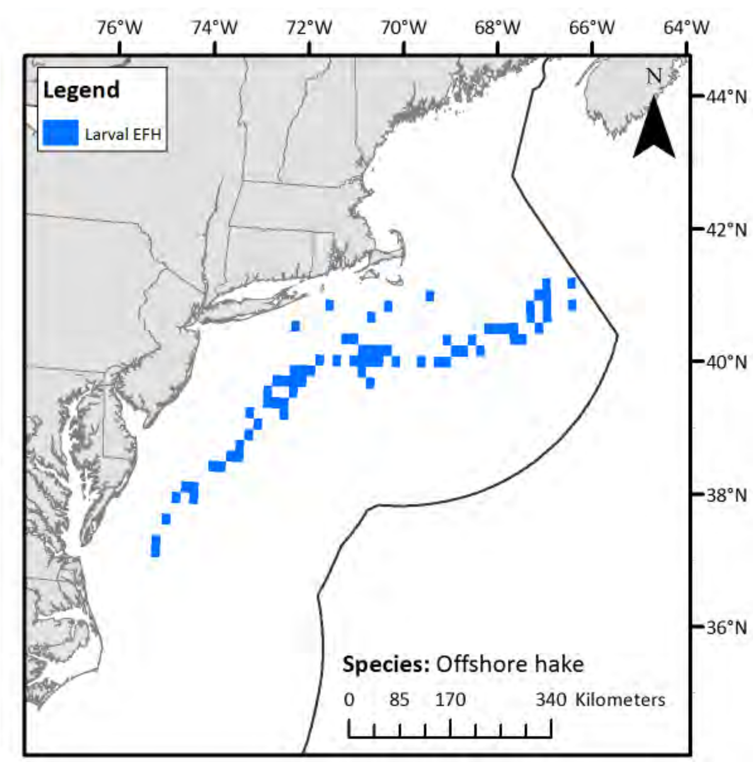
Juveniles: Pelagic and benthic habitats on the outer continental shelf and slope in depths of 160 – 750 meters as shown on Map 81.

Adults: Pelagic and benthic habitats on the outer continental shelf and slope in depths of 200 – 750 meters as shown on Map 81. Spawning generally occurs between 330 and 550 meters.

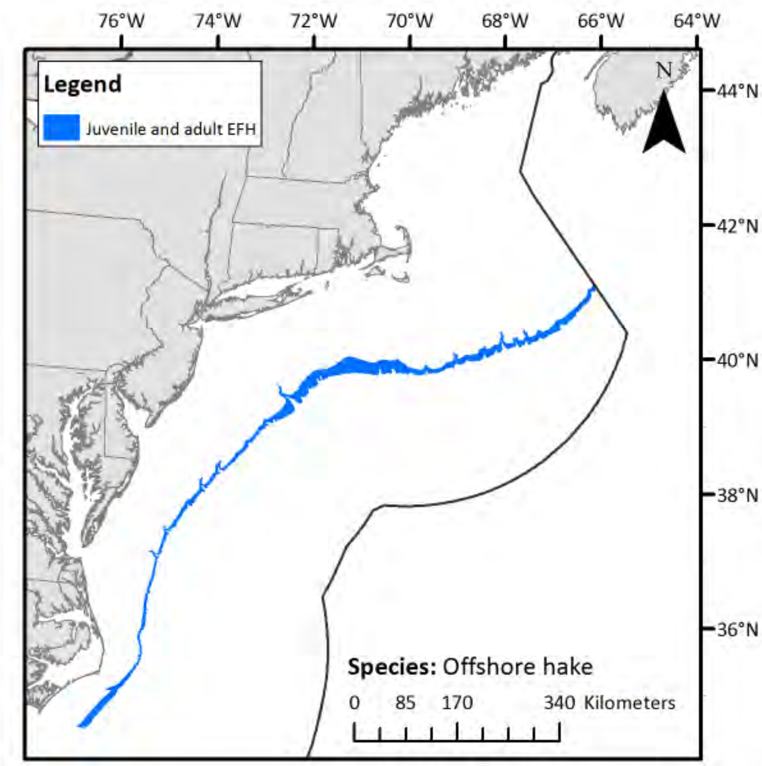
Map 79 – Offshore hake egg EFH.



Map 80 – Offshore hake larval EFH.



Map 81 – Offshore hake juvenile and adult EFH.



2.2.3 Monkfish

The proposed EFH map for monkfish eggs and larvae is based on the distribution of adult and larval monkfish.[32] The proposed EFH map includes all the ten minute squares where adult monkfish were caught during 1968-2005 in the fall and spring NMFS trawl survey, plus all the ten minute squares where monkfish larvae were collected during 1978-1987 in the NMFS MARMAP ichthyoplankton survey. Inshore, the proposed designation includes ten minute squares where adult monkfish were caught in state trawl surveys in more than 10% of the tows. The proposed designation also includes the continental slope where monkfish larvae have been collected in the 1000-1500 meter depth range (see Appendix B). This designation was referred to as Alternative 4 in the Phase 1 DEIS.

The proposed EFH maps for juvenile and adult monkfish are based on the distributions of depths and bottom temperatures that are associated with high catch rates of juveniles and adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. The maps are also based on average catch per tow data in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 75th percentile of catch level. Both maps include the same area of the continental slope where monkfish were determined to be present based on

[32] Monkfish eggs occur in large, mucoidal "veils" which are not sampled adequately in traditional ichthyoplankton surveys.

maximum depth information and the geographic range of the species. These designations were referred to as Juvenile/Adult Alternatives 3C in the Phase 1 DEIS.

The depth ranges given for both juveniles and adults in the no action designations are very restricted (25-200 m) given the fact that monkfish occupy benthic habitats in very deep water beyond the edge of the continental shelf. The proposed designations would extend EFH more explicitly to the edge of the shelf and down to 1000 meters on the continental slope. The proposed EFH map for eggs and larvae is almost identical to the no action map. The proposed juvenile and adult maps are similar to the no action maps, but are more limited to the middle and outer continental shelf (depths >50 meters) in the Mid-Atlantic.

Text descriptions:

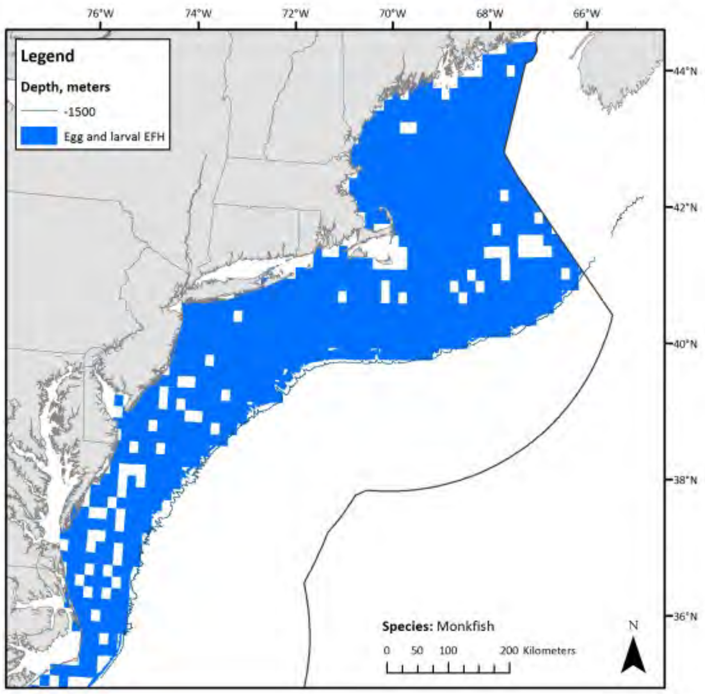
Essential fish habitat for monkfish (*Lophius americanus*) is designated anywhere within the geographic areas that are shown on the following maps and meets the conditions described below.

Eggs and Larvae: Pelagic habitats in inshore areas, and on the continental shelf and slope throughout the Northeast region, as shown on Map 82. Monkfish eggs are shed in very large buoyant mucoidal egg "veils." Monkfish larvae are more abundant in the Mid-Atlantic region and occur over a wide depth range, from the surf zone to depths of 1000 to 1500 meters on the continental slope.

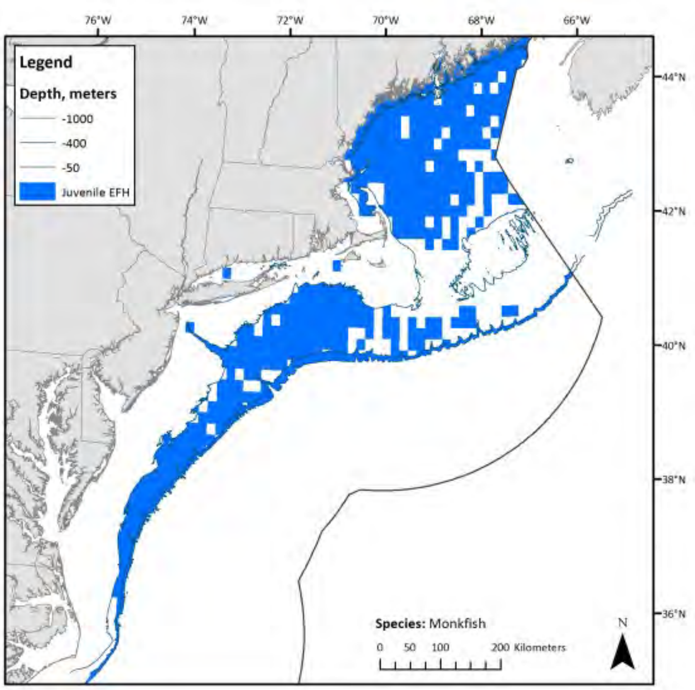
Juveniles: Sub-tidal benthic habitats in depths of 50 to 400 meters in the Mid-Atlantic, between 20 and 400 meters in the Gulf of Maine, and to a maximum depth of 1000 meters on the continental slope, as shown on Map 83. A variety of habitats are essential for juvenile monkfish, including hard sand, pebbles, gravel, broken shells, and soft mud; they also seek shelter among rocks with attached algae. Juveniles collected on mud bottom next to rock-ledge and boulder fields in the western Gulf of Maine were in better condition than juveniles collected on isolated mud bottom, indicating that feeding conditions in these edge habitats are better. Young-of-the-year juveniles have been collected primarily on the central portion of the shelf in the Mid-Atlantic, but also in shallow nearshore waters off eastern Long Island, up the Hudson Canyon shelf valley, and around the perimeter of Georges Bank. They have also been collected as deep as 900 meters on the continental slope.

Adults: Sub-tidal benthic habitats in depths of 50 to 400 meters in southern New England and Georges Bank, between 20 and 400 meters in the Gulf of Maine, and to a maximum depth of 1000 meters on the continental slope, as shown on Map 84. Essential fish habitat for adult monkfish is composed of hard sand, pebbles, gravel, broken shells, and soft mud. They seem to prefer soft sediments (fine sand and mud) over sand and gravel, and, like juveniles, utilize the edges of rocky areas for feeding.

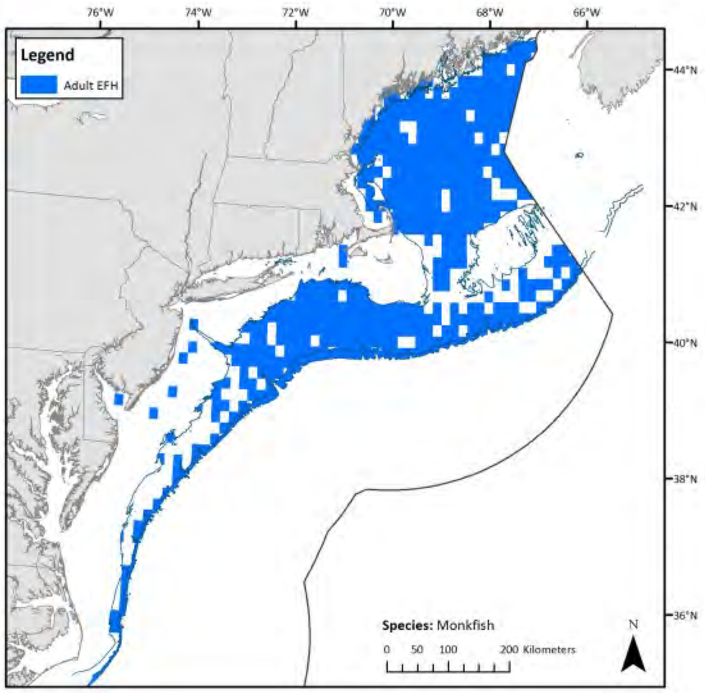
Map 82 – Monkfish egg and larval EFH.



Map 83 – Monkfish juvenile EFH.



Map 84 – Monkfish adult EFH.



2.2.4 Skates

Note: There are no egg or larval EFH designations for any of the skates. This is because egg case distributions and habitat associations are not well understood, and they emerge from their egg cases as fully developed juveniles, so there is no larval stage.

With the exception of barndoor skate and rosette skate, most of the skate species EFH designations include map coverage in various estuaries and embayments. Relative to the 2003 No Action designations, three modifications were made: 1) Gulf of Maine bays and estuaries were added to the maps when appropriate; 2) Revisions were made in some cases to the assignments of juveniles and adults to individual estuaries in both regions, and; 3) Three estuaries that were not included in the ELMR reports were added (indicated with an * in tables below). Table 28 summarizes these designations by species and lifestages.

Table 28 – Skate EFH designation for estuaries and embayments.

Estuaries and Embayments	Juveniles	Adults
Passamaquoddy Bay	Smooth, thorny, little, winter	Little
Englishman/Machias Bay	Smooth, thorny, little, winter	Little
Narraguagus Bay	Smooth, thorny, little, winter	Little
Blue Hill Bay	Smooth, thorny, little, winter	Little

Estuaries and Embayments	Juveniles	Adults
Penobscot Bay	Smooth, thorny, little, winter	Little
Muscongus Bay	Smooth, thorny, little, winter	Little
Damariscotta River	Smooth, thorny, little, winter	Little
Sheepscot River	Smooth, thorny, little, winter	Little
Kennebec / Androscoggin	Smooth, thorny, little, winter	Little
Casco Bay	Smooth, thorny, little, winter	Little
Saco Bay	Smooth, thorny, little, winter	Little
Great Bay	Smooth, thorny, little, winter	Little
Hampton Harbor*	Thorny, little, thorny	Little
Plum Island Sound*	Thorny, little, winter	Little
Massachusetts Bay	Thorny, little, winter	Little, winter
Boston Harbor	Thorny, little, winter	Little, winter
Cape Cod Bay	Thorny, little, winter	Little, winter
Waquoit Bay		
Buzzards Bay	Little, winter	Little, winter
Narragansett Bay	Little, winter	Little, winter
Long Island Sound	Little, winter	Little, winter
Connecticut River	Little, winter	Little, winter
Gardiners Bay	Little, winter	Little, winter
Great South Bay	Little, winter	Little, winter
Hudson River / Raritan Bay	Little, winter, clearnose	Little, winter, Clearnose
Barnegat Bay	Little, winter, clearnose	Little, winter, clearnose
New Jersey Inland Bays	Little, winter, clearnose	Little, winter, clearnose
Delaware Bay	Little, winter, clearnose	Little, winter, clearnose
Delaware Inland Bays	Little, winter, clearnose	Little, winter, clearnose
Maryland Inland Bays*	Little, winter, clearnose	Little, winter, clearnose
Chincoteague Bay	Winter, clearnose	Winter, clearnose
Chesapeake Bay	Clearnose	Little, winter, clearnose

All designations are for the full salinity zone only (> 25‰) except for Delaware Bay, Delaware Inland Bays, and Chespeake Bay, which also include mixed salinities (0.5-25‰). The Connecticut River only has a mixed salinity zone.
** = This water body was not included in the original ELMR reports, but it was included in the salinity zone maps that were appended to all the relevant fishery management plans and amendments which implemented the no action EFH designations; EFH designations were inferred in these locations if there were ELMR-based designations in the adjacent north and south locations.*

2.2.4.1 Smooth skate

The proposed EFH maps for juvenile and adult smooth skate are based on the distributions of depths and bottom temperatures that are associated with high catch rates of juveniles and adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. The maps are also based on average catch per tow data for juveniles and adults in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level, and include inshore areas where juvenile or adult smooth skate were caught in 10% or more of the tows made in individual ten minute squares during state trawl surveys. Based on the ELMR information for skates (not identified to species) and the known geographic range of this species (see Appendix A), EFH for juvenile smooth skates was added to the proposed map for the high salinity portions of bays and estuaries along the Maine and New Hampshire coasts. The proposed EFH designations also include maximum depth and geographic range information for the continental slope. These designations were 3D alternatives in the Phase 1 DEIS.

The proposed text descriptions for juvenile and adult smooth skate define EFH on the continental slope as well as in the Gulf of Maine. They also extend the minimum depth into deeper water in the Gulf of Maine (100 vs. 30 meters). The proposed EFH map for juvenile smooth skate covers a more continuous area in the outer Gulf of Maine than the no action map. It also includes inshore bays and estuaries that were left out of the original map. Because the original map for the adults was based solely on survey data, it only included a few ten minute squares. The proposed adult EFH map, which includes a preferred habitat layer, is much more representative of EFH for adults of this species in the outer Gulf of Maine and along the continental slope. Expansions of the depth ranges for both life stages (from 120-400 to 100-400 m for the juveniles and from 120-300 to 100-400 m for the adults) caused an enlargement of the proposed EFH maps to cover more area in the Gulf of Maine.

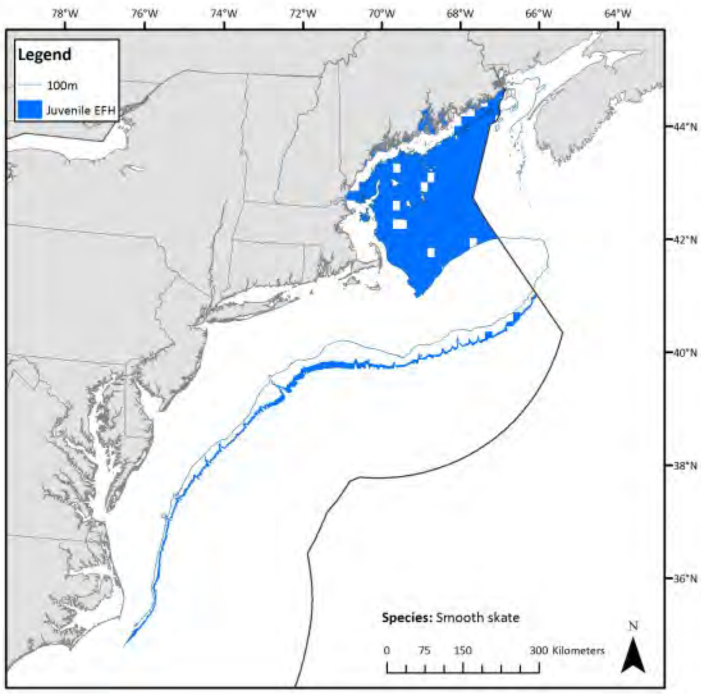
Text descriptions:

For smooth skate (*Malacoraja senta*), essential fish habitat is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 28 and meets the conditions described below. Additional habitat-related information for this species can be found in Appendix B.

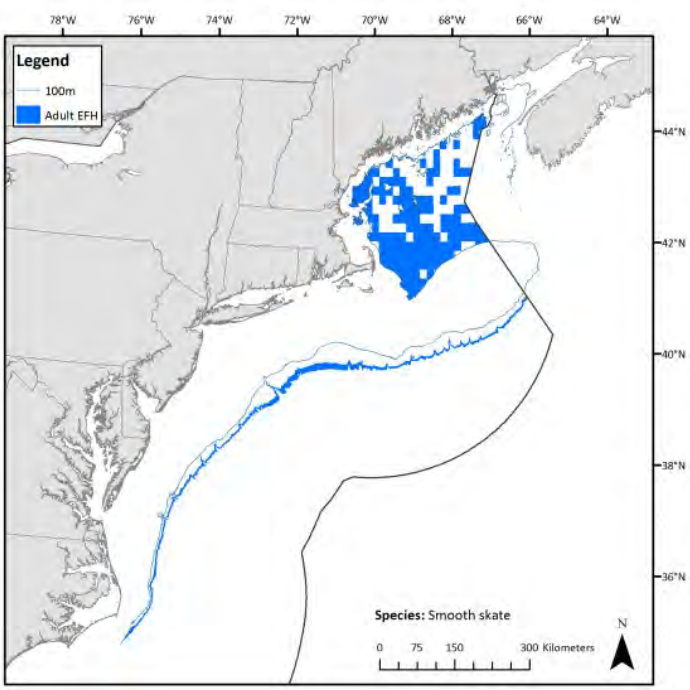
Juveniles: Benthic habitats between 100 and 400 meters in the Gulf of Maine, on the continental slope to a depth of 900 meters, and in depths less than 100 meters in the high salinity zones of a number of bays and estuaries along the Maine coast, as shown on Map 85 and listed in Table 28. Essential fish habitat for juvenile smooth skates occurs mostly on soft mud in deeper areas, but also on sand, broken shells, gravel, and pebbles on offshore banks in the Gulf of Maine.

Adults: Benthic habitats between 100 and 400 meters in the Gulf of Maine and on the continental slope to a depth of 900 meters, as shown on Map 86. Essential fish habitat for juvenile smooth skates occurs mostly on soft mud in deeper areas, but also on sand, broken shells, gravel, and pebbles on offshore banks in the Gulf of Maine.

Map 85 – Smooth skate juvenile EFH.



Map 86 – Smooth skate adult EFH.



2.2.4.2 Thorny skate

The proposed EFH maps for juvenile and adult thorny skate are based on the distributions of depths and bottom temperatures that were associated with high catch rates of juveniles or adults in the 1963-2003 spring and fall NMFS trawl surveys. They are also based on average catch per tow data for juveniles and adults in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 75th (juveniles) and 90th (adult) percentiles of catch, and include inshore areas where juvenile and adult thorny skate were caught in 10% or more of the tows made in individual ten minute squares during state trawl surveys. Based on the ELMR information for skates (not identified to species) and the known geographic range of this species (see Appendix A), EFH for juvenile thorny skates was added to the proposed map for the high salinity portions of bays and estuaries in the Gulf of Maine. The proposed EFH designations also include maximum depth and geographic range information for the continental slope. The juvenile designation was Alternative 3C in the Phase 1 DEIS and the adult designation was Alternative 3D.

The proposed EFH text descriptions for each life stage are distinct whereas in the no action designations, they are identical. For both life stages, the proposed maximum depth is 900 instead of 2000 meters. The proposed juvenile map includes inshore bays and estuaries that were left out of the original EFH map. The proposed adult map includes much more of the outer Gulf of Maine than the no action map. Both proposed maps add the continental slope down to 900 meters. As modified, the proposed adult EFH designation for thorny skate extends into shallower water (80 vs 120 m); there were no changes to the juvenile depth range, and, thus, no significant changes in the map.

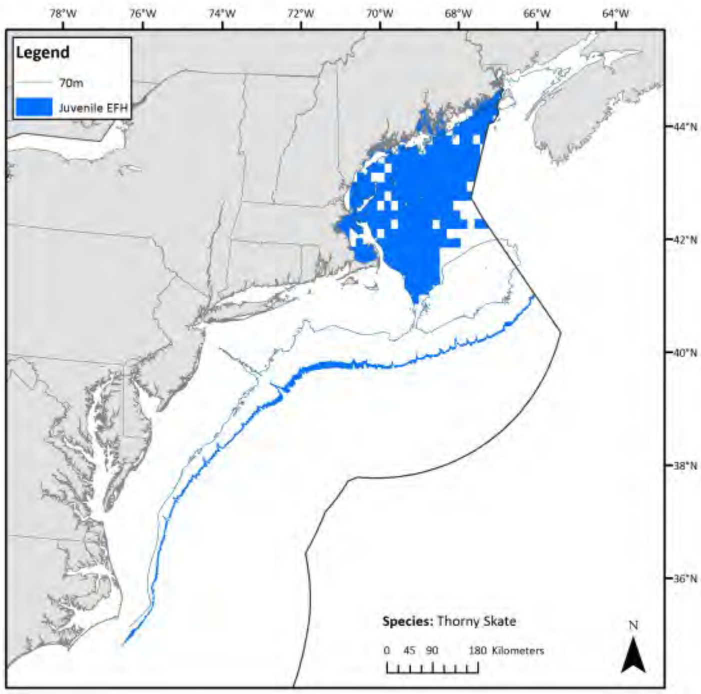
Text description:

For thorny skate (*Amblyraja radiata*), essential fish habitat is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 28 and meets the conditions described below. Additional habitat-related information for this species can be found in Appendix B.

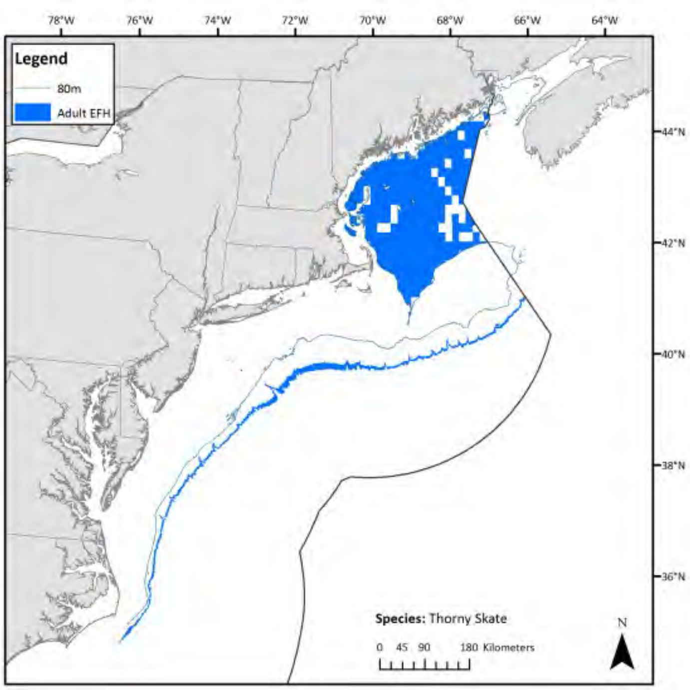
Juveniles: Benthic habitats between 35 and 400 meters in the Gulf of Maine, on the continental slope to a depth of 900 meters, and in shallower water in the high salinity zones of a number of bays and estuaries north of Cape Cod, as shown on Map 87 and listed in Table 28. Essential fish habitat for juvenile thorny skates is found on a wide variety of bottom types, including sand, gravel, broken shells, pebbles, and soft mud.

Adults: Benthic habitats between 80 and 300 meters in the Gulf of Maine and on the continental slope to a depth of 900 meters, as shown on Map 88 and listed in Table 28. Essential fish habitat for adult thorny skates is found on a wide variety of bottom types, including sand, gravel, broken shells, pebbles, and soft mud.

Map 87 – Thorny skate juvenile EFH.



Map 88 – Thorny skate adult EFH.



2.2.4.3 Barndoor skate

The proposed EFH map for juvenile and adult barndoor skate on the continental shelf is based on the distribution of depths and bottom temperatures that were either associated with high catch rates of juveniles and adults in the 1963-2003 spring and fall NMFS trawl surveys, or were identified in the EFH Source Document for this species. It is also based on average catch per tow data for juveniles in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch level, and includes areas on the continental slope where barndoor skate were determined to be present, based on the reported maximum depth and geographic range of the species.[33] These juvenile and adult designations were referred to as alternative 3D in the Phase 1 DEIS.

The proposed new EFH map for barndoor skate juveniles and adults extends primarily over the southern portion of Georges Bank, into southern New England, and along the continental slope. The no action maps – which were done separately for juveniles and adults – designated EFH in just a few randomly scattered ten minute squares, mostly on Georges Bank. Because it incorporates habitat features in addition to survey catch data, the proposed EFH map extends over a more continuous geographic area. The separate text descriptions that were approved in 2007 were combined into a single description with some specific depth information for each life stage.

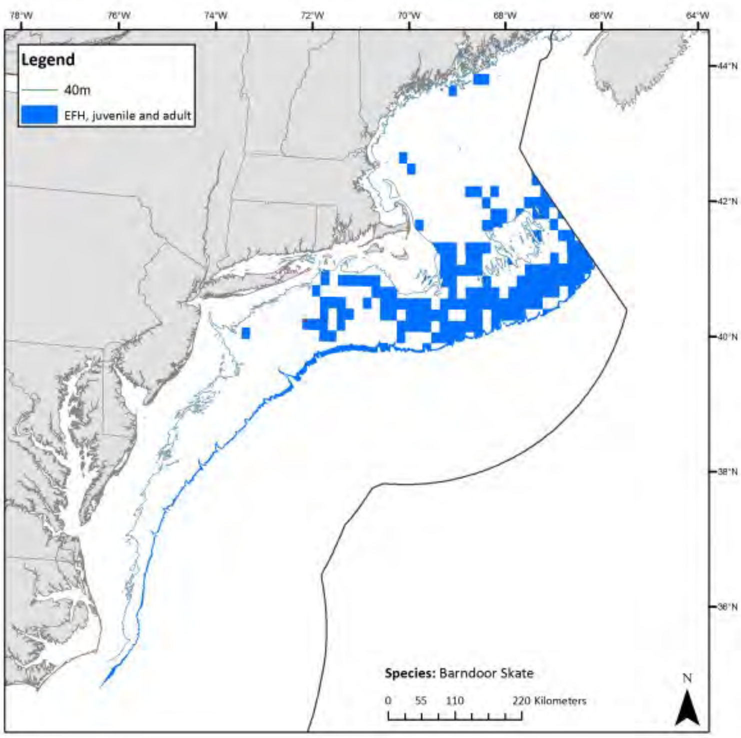
Text descriptions:

For barndoor skate (*Dipturus laevis*), essential fish habitat is designated anywhere within the geographic areas that are shown on Map 89 and meets the conditions described below. Additional habitat-related information for this species can be found in Appendix B.

Juveniles and Adults: Benthic habitats on the continental shelf, primarily on Georges Bank and in southern New England, in depths of 40 – 400 meters, and on the continental slope to a maximum depth of 750 meters, as shown on Map 89. Essential fish habitat for juvenile and adult barndoor skates occurs on mud, sand, and gravel substrates. Both life stages are usually found on the continental shelf in depths less than 160 meters, but the adults also occupy benthic habitats between 300 and 400 meters on the outer shelf.

[33] Very few adults are caught in the NMFS trawl survey, so survey data for juveniles were used to correlate catch with habitat features and to map the distribution of both life stages on the shelf.

Map 89 – Barndoor skate juvenile and adult EFH.



2.2.4.4 Little skate

The proposed EFH maps for juvenile and adult little skate are based on the distribution of depths and bottom temperatures that are associated with high catch rates of juveniles or adults in the 1963-2003 spring and fall NMFS trawl surveys. Depth and bottom temperature information from the EFH Source Document was used to supplement survey information as needed. The proposed new maps are also based on average catch per tow data for juveniles and adults, respectively, in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 75^{th} percentile of catch level, and they include inshore areas where juvenile or adult little skate were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys and ELMR information. The ELMR information for the Mid-Atlantic area was re-interpreted to add EFH for juvenile little skate to five inshore areas south of Raritan Bay, including Delaware Bay, and to eliminate the no action designations for juveniles and adults in Chesapeake Bay (see Appendix A). Some of the estuaries and embayments north of Cape Cod that were not originally designated as EFH were also added to the new maps.[34] These juvenile and adult designations were referred to as 3C alternatives in the Phase 1 DEIS.

[34] For some reason, none of the original EFH designations for any of the skate species (NMFS 2002) included the ELMR areas north of Cape Cod, even though the abundance of "skates" (unidentified to species) were evaluated in the North and Mid-Atlantic regions (see Jury et al. 1994 and Stone et al. 1994). This was an oversight since four of the skate species managed by the New England Fishery Management Council – including little skate – are common in the Gulf of Maine (see Appendix A).

The proposed EFH map for juvenile little skate extends over most of the continental shelf from Delaware Bay to Georges Bank (to a maximum depth of 80 meters) and includes considerably more coastal waters in the Gulf of Maine than the original EFH map. The no action map – because it was based on 100% of the NMFS survey data – extends all the way to the shelf break. The no action and proposed new EFH maps for adult little skate are more similar than the juvenile maps, but there are some differences. As proposed, EFH would include more coastal waters in New Jersey and the Gulf of Maine. Chesapeake Bay would no longer be designated as EFH for little skate (juveniles or adults) if the proposed designations are approved and the high salinity zones of nearly all the ELMR areas north of Cape Cod would be added to the designations. The level 2 EFH depth information provided for both life stages in the no action text descriptions is the same, and is very restricted (73-91 m), as opposed to the broader depth ranges identified in the proposed descriptions, which would extend EFH more explicitly into nearshore waters with maximum depths of 80 (juveniles) and 100 (adults) meters. The substrate information in the no action and proposed new designations is the same.

As modified, the proposed map for juvenile little skates extends into deeper water (80 vs. 70 meters) and thus includes more of the continental shelf than the map that was approved in June 2007; it also excludes Chesapeake Bay. The modified adult map is very similar to the original approved map since the maximum depth did not change. The only noticeable changes are the addition of shallow water on Georges Bank (the minimum depth on the shelf was reduced from 30 to 20 meters) and the elimination of Chesapeake Bay.

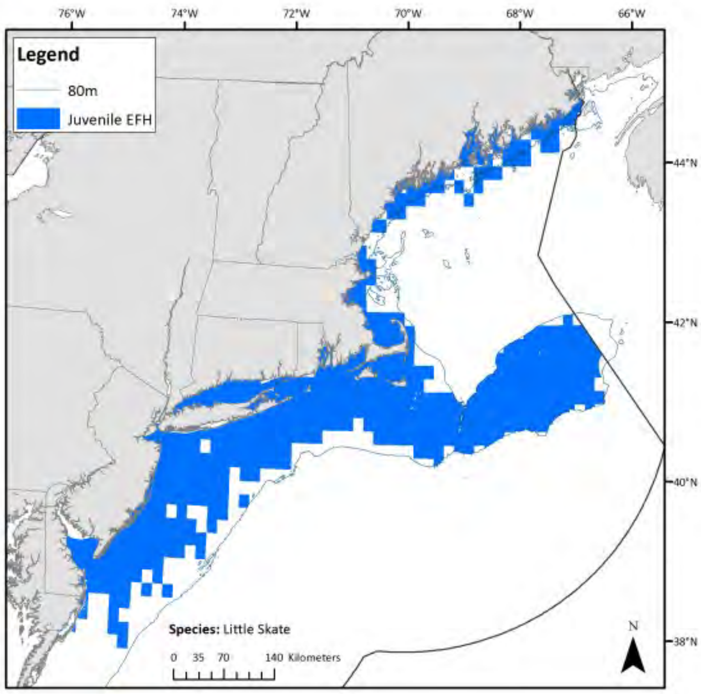
Text descriptions:

For little skate (*Leucoraja erinacea*), essential fish habitat is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 28 and meets the conditions described below. Additional habitat-related information for this species can be found in Appendix B.

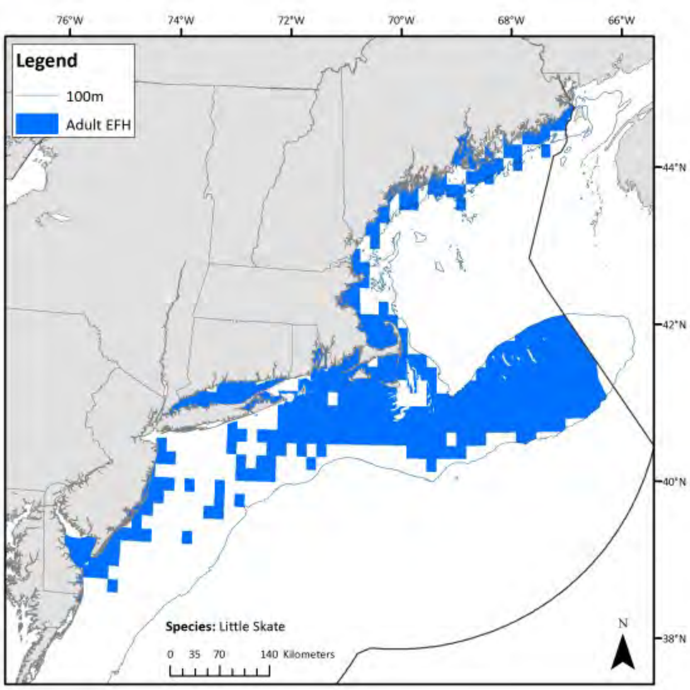
Juveniles: Intertidal and sub-tidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 80 meters, as shown on Map 90, and including high salinity zones in the bays and estuaries listed in Table 28. Essential fish habitat for juvenile little skates occurs on sand and gravel substrates, but they are also found on mud.

Adults: Intertidal and sub-tidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 100 meters, as shown on Map 91, and including high salinity zones in the bays and estuaries listed in Table 28. Essential fish habitat for adult little skates occurs on sand and gravel substrates, but they are also found on mud.

Map 90 – Little skate juvenile EFH.



Map 91 – Little skate adult EFH.



2.2.4.5 Winter skate

The proposed EFH maps for juvenile and adult winter skate are based on the distributions of depths and bottom temperatures that were either associated with high catch rates of juveniles and adults, respectively, in the 1963-2003 spring and fall NMFS trawl surveys. The proposed maps are also based on average catch per tow data in ten minute squares of latitude and longitude for juveniles and adults, respectively, in the 1968-2005 spring and fall NMFS trawl surveys at the 90th percentile of catch, and they include inshore areas where juvenile or adult white hake were caught in 10% or more of the tows made in individual ten minute squares during state trawl surveys as well as coastal bays and estuaries identified in the ELMR reports. The ELMR information for the Mid-Atlantic area was re-interpreted to add EFH for juvenile winter skate to five inshore areas south of Raritan Bay, including Delaware Bay, and to eliminate the no action designations for juveniles and adults in Chesapeake Bay (see Appendix A). Some of the ELMR estuaries and embayments north of Cape Cod that were not originally designated as EFH were also added to the new maps (see footnote for little skates). A few unsurveyed ten minute squares were filled in along the Rhode Island and Connecticut coasts and southeast of Nantucket Island. The designations are 3E alternatives in the Phase 1 DEIS.

The proposed designations would limit EFH to a maximum depth of 90 meters for juvenile winter skates and 80 meters for the adults. The depth ranges given in the no action designations are much less specific (shoreline to 400 or 371 meters, more abundant less than 111 meters). The proposed EFH map for juvenile winter skate includes more considerably more area in the Mid-Atlantic Bight compared to the no action map. The no action adult map is almost completely limited to Georges Bank and the waters directly south of Cape Cod; the proposed new map extends EFH for adult winter skate to continental shelf waters south of Delaware Bay and adds more of the southwestern Gulf of Maine.

Modification of the juvenile EFH designation to include shelf waters out to 90 meters instead of 80 meters caused most of Georges Bank to “fill in” and extended EFH westwards without interruption into the Mid-Atlantic and farther out on the shelf. The other significant change was the elimination of EFH in Chesapeake Bay. Maximum depth for the adults increased by 20 meters (from 60 to 80) and had a similar effect on the proposed map; EFH now extends across the Great South Channel (except for the shoal water east of Nantucket) and Chesapeake Bay has been removed. The rest of the new map looks very much like the map that was approved in 2007.

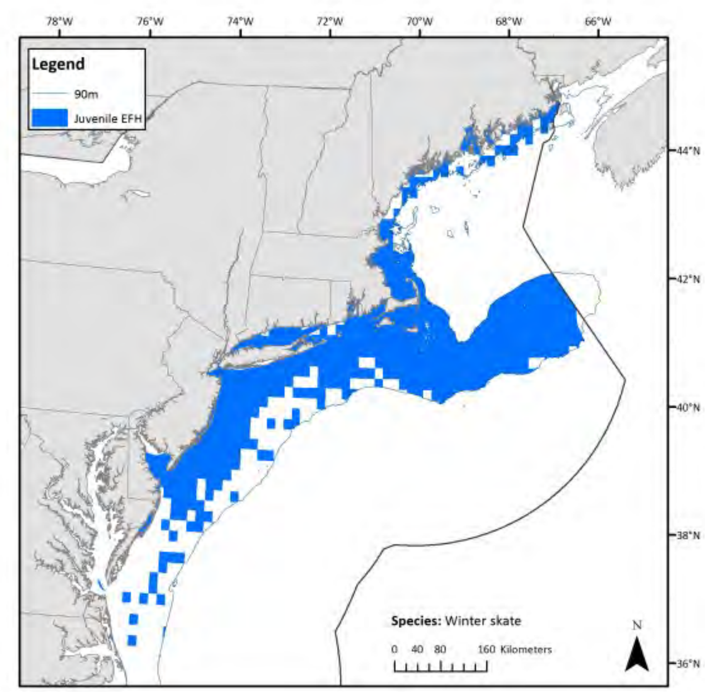
Text descriptions:

For winter skate (*Leucoraja ocellata*), essential fish habitat is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 28 and meets the conditions described below.

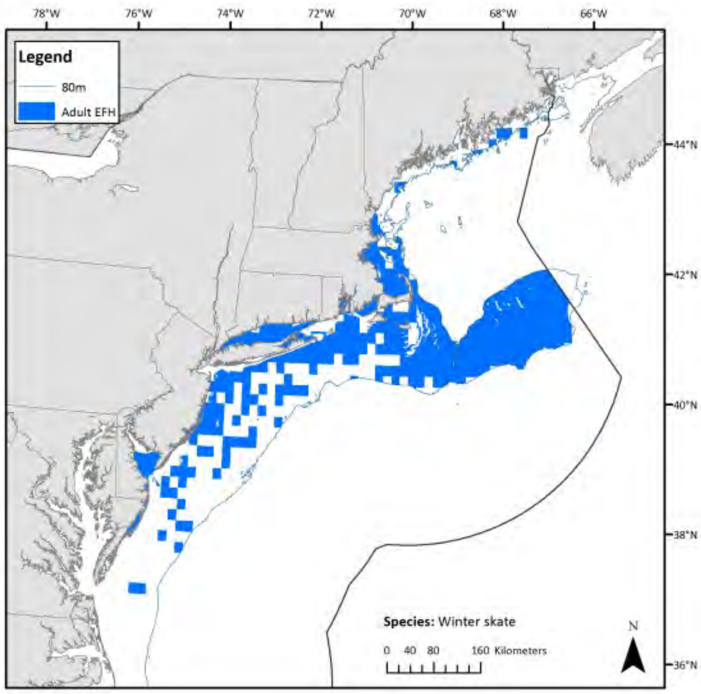
Juveniles: Sub-tidal benthic habitats in coastal waters from eastern Maine to Delaware Bay and on the continental shelf in southern New England and the Mid-Atlantic region, and on Georges Bank, from the shoreline to a maximum depth of 90 meters, as shown on Map 92, including the high salinity zones of the bays and estuaries listed in Table 28. Essential fish habitat for juvenile winter skates occurs on sand and gravel substrates, but they are also found on mud.

Adults: Sub-tidal benthic habitats in coastal waters in the southwestern Gulf of Maine, in coastal and continental shelf waters in southern New England and the Mid-Atlantic region, and on Georges Bank, from the shoreline to a maximum depth of 80 meters, as shown on Map 93, including the high salinity zones of the bays and estuaries listed in Table 28. Essential fish habitat for adult winter skates occurs on sand and gravel substrates, but they are also found on mud.

Map 92 – Winter skate juvenile EFH.



Map 93 – Winter skate adult EFH.



2.2.4.6 Rosette skate

Because very few adults are caught in the NMFS bottom trawl survey, the proposed EFH map for juvenile and adult rosette skate is based on the distribution of depths and bottom temperatures that were either associated with high catch rates of juveniles in the 1963-2003 spring and fall NMFS trawl surveys. The map is also based on average catch per tow data for juveniles in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 75th percentile of catch level. It was referred to as Alternative 3C in the Phase 1 DEIS.

The proposed text description is very similar to the no action descriptions, which were developed separately, but are identical. The no action map for juvenile rosette skates includes the same portion of the outer continental shelf (Hudson Canyon to Cape Hatteras) as the proposed juvenile/adult map, from approximately 40˚N to Cape Hatteras.[35] As modified, the proposed designation covers a broader depth range than what was approved in the DEIS (80-400 vs 70-300 meters), but the two maps look the same. The range of this species extends to the Dry Tortugas in Florida in deep water, but in the absence of any survey data upon which to base a map, the EFH designation does not extend south of Cape Hatteras.

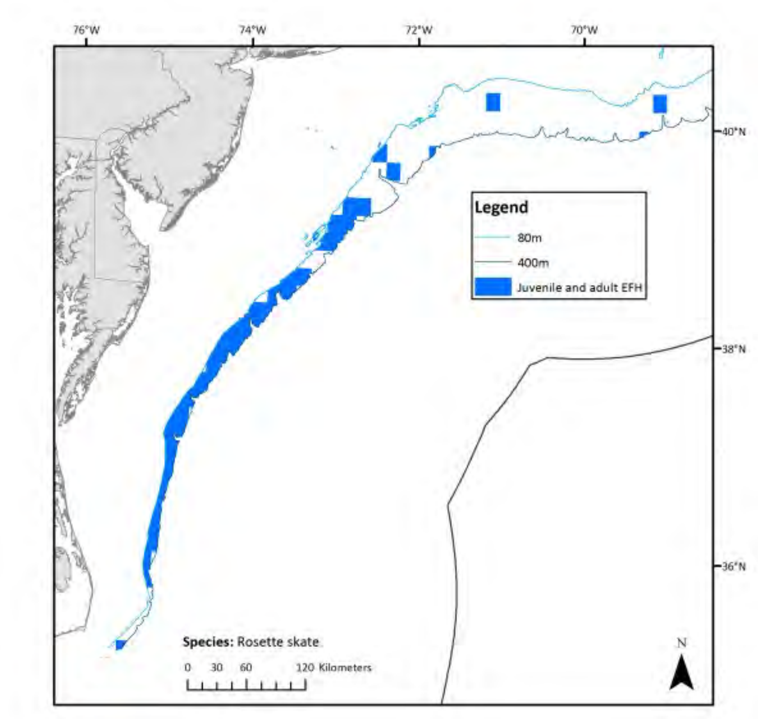
Text descriptions:

[35] There are two status quo EFH maps, one for juvenile rosette skates and one for adults. There are only seven ten minute squares in the adult map; they are located southeast of Long Island on the outer shelf at the northern end of the juvenile distribution.

For rosette skate (*Leucoraja garmani*), essential fish habitat is designated anywhere within the geographic areas that are shown on Map 94 and meets the conditions described below. Additional habitat-related information for this species can be found in Appendix B.

Juveniles and Adults: Benthic habitats with mud and sand substrates on the outer continental shelf in depths of 80 – 400 meters from approximately 40˚N latitude to Cape Hatteras, North Carolina, as shown on Map 94.

Map 94 – Rosette skate juvenile and adult EFH.



2.2.4.7 Clearnose skate

The proposed EFH maps for juvenile and adult clearnose skate within the NMFS trawl survey area were developed using a GIS depiction of preferred depth and bottom temperature ranges for each life stage that were determined from graphical 1963-2003 spring and fall NMFS trawl survey data in Packer et al. (2003b). The maps are also based on average catch per tow data for juveniles and adults in ten minute squares of latitude and longitude in the 1968-2005 spring and fall NMFS trawl surveys at the 75th percentile of catch level, and include inshore areas between New Jersey and Florida where juveniles or adults were caught in 10% or more of tows made in individual ten minute squares during state trawl surveys andeight embayments between Raritan Bay and Chesapeake Bay, including Delaware Bay. These juvenile and adult designations were referred to as 3C alternatives in the Phase 1 DEIS.

The proposed new EFH designation for adult clearnose skates extends over the same geographic area as the no action map – continental shelf waters from Raritan Bay, New Jersey, to Cape Fear, North Carolina.[36] The new maps exclude portions of survey-defined ten minute squares that are deeper than the maximum depths defined in the text descriptions (30 m for juveniles and 40 m for adults) and, therefore, limit EFH to the inner portion of the continental shelf. These maximum depths are much lower than what was included in the no action descriptions ("most abundant less than 111 meters") and match what is mapped much more explicitly. The other change relative to the no action designations was the addition of gravel and rocky bottom to the proposed new text descriptions: the original descriptions only defined EFH as occurring on "soft bottom" (interpreted to mean mud and sand).

Four modifications were made to the proposed EFH maps that were approved in the 2007 DEIS: 1) The maximum depth for adults was changed from 30 to 40 meters; 2) the mixed salinity zones in the Mid-Atlantic were removed from the adult designation (see salinity data in Appendix B); 3) EFH designations for the juveniles and adults now include fully saline waters in several coastal bays in the Mid-Atlantic that were not designated at all originally, or were only designated for adults; and 4) inshore trawl survey data (SEAMAP survey) collected south of Cape Hatteras were analyzed for the new juvenile map, extending EFH all the way to northern Florida. In addition, intertidal habitat was removed from the approved text descriptions in the DEIS for lack of evidence.

Text descriptions:

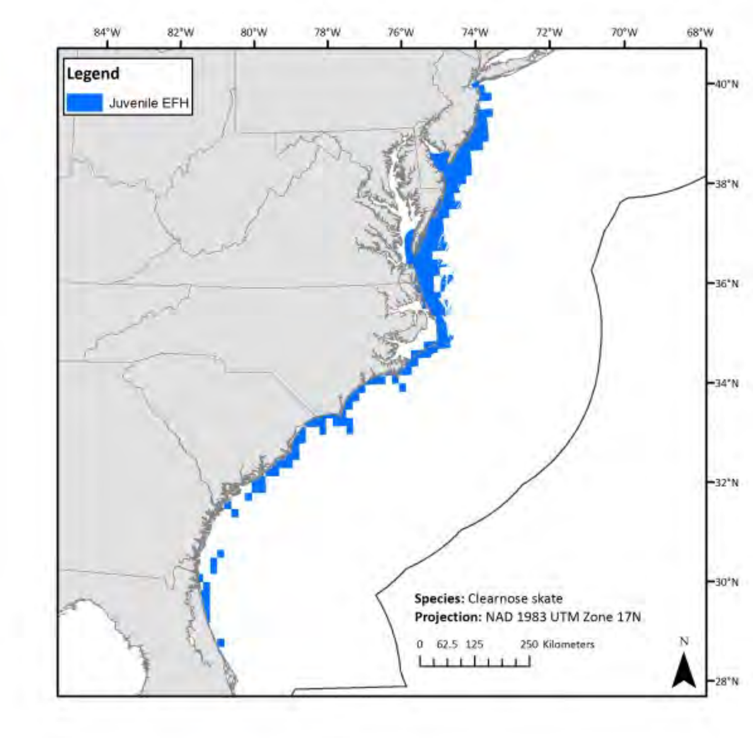
For clearnose skate (*Raja eglanteria*), essential fish habitat is designated anywhere within the geographic areas that are shown on the following maps and listed in Table 28 and meets the conditions described below. Additional habitat-related information for this species can be found in Appendix B.

Juveniles: Sub-tidal benthic habitats in coastal and inner continental shelf waters from New Jersey to the St. Johns River in Florida as shown on Table 28, including the high salinity zones of Chesapeake Bay, Delaware Bay, and the other bays and estuaries listed in Table 28. Essential fish habitat for juvenile clearnose skates occurs from the shoreline to 30 meters, primarily on mud and sand, but also on gravelly and rocky bottom.

Adults: Sub-tidal benthic habitats in coastal and inner continental shelf waters from New Jersey to Cape Hatteras as shown on Map 96, including the high salinity zones of Chesapeake Bay, Delaware Bay, and the other bays and estuaries listed in Table 28. Essential fish habitat for adult clearnose skates occurs from the shoreline to 40 meters, primarily on mud and sand, but also on gravelly and rocky bottom.

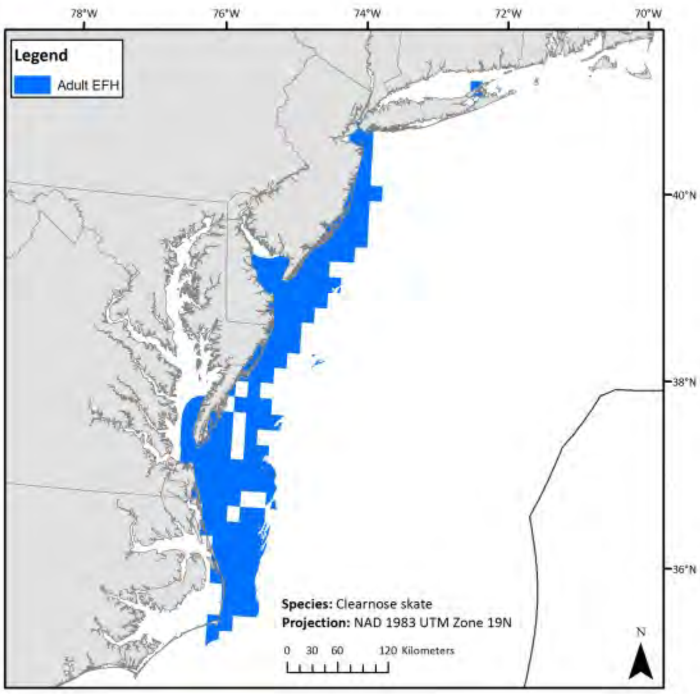
[36] The original EFH maps for all the skates do not show the coastal ELMR areas that were included in the designations – they were listed in tables only. Thus, Chesapeake Bay was designated for juvenile and adult clearnose skates, but is not shown on the maps.

Map 95 – Clearnose skate juvenile EFH.



Note that this map is in a different projection than the other EFH maps because it extends so far to the south.

Map 96 – Clearnose skate adult EFH.



2.2.5 Atlantic sea scallop

The EFH map for all life stages of Atlantic sea scallops includes all the ten minute squares where scallops of any size were caught during the following surveys: 1968-2011 NMFS trawl (fall and spring), 1981-2012 NMFS summer scallop dredge, 2000-2013 Maine/NH trawl, and 2005-2013 Maine scallop dredge. For each survey, scallop EFH was only identified if at least three tows were conducted in a particular ten minute square. Thus, some ten minute squares with very low sampling rates could not be designated EFH on the basis of some surveys, despite having positive catches of scallops. In addition, the map includes bays and estuaries identified by the NOAA ELMR program where juvenile or adult Atlantic sea scallops were "common" or "abundant."

Text descriptions:

Essential fish habitat for Atlantic sea scallops (*Placopecten magellanicus*) is designated anywhere within the geographic areas that are shown on Map 97 and listed in Table 29 which exhibit the environmental conditions defined in the following text descriptions.

Eggs: Benthic habitats in inshore areas and on the continental shelf as shown on Map 97, in the vicinity of adult scallops. Eggs are heavier than seawater and remain on the seafloor until they develop into the first free-swimming larval stage.

Larvae: Benthic and water column habitats in inshore and offshore areas throughout the region, as shown on Map 97. Any hard surface can provide an essential habitat for settling pelagic larvae ("spat"), including shells, pebbles, and gravel. They also attach to macroalgae and other benthic organisms such as hydroids. Spat attached to sedentary branching organisms or any hard surface have greater survival rates; spat that settle on shifting sand do not survive.

Juveniles: Benthic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic, as shown on Map 97, in depths of 18 to 110 meters. Juveniles (5-12 mm shell height) leave the original substrate on which they settle (see spat, above) and attach themselves by byssal threads to shells, gravel, and small rocks (pebble, cobble), preferring gravel. As they grow older, they lose their byssal attachment. Juvenile scallops are relatively active and swim to escape predation. While swimming, they can be carried long distances by currents. Bottom currents stronger than 10 cm/sec retard feeding and growth. In laboratory studies, maximum survival of juvenile scallops occurred between 1.2 and 15°C and above salinities of 25 ppt. On Georges Bank, age 1 juveniles are less dispersed than older juveniles and adults and are mainly associated with gravel-pebble deposits. Essential habitats for older juvenile scallops are the same as for the adults (gravel and sand).

Adults: Benthic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic, as shown on Map 97. Essential habitats for older juvenile and adult sea scallops are found on sand and gravel substrates in depths of 18 to 110 meters, but they are also found in shallower water and as deep as 180 meters in the Gulf of Maine. In the Mid-Atlantic they are found primarily between 45 and 75 meters and on Georges Bank they are more abundant between 60 and 90 meters. They often occur in aggregations called beds which may be sporadic or essentially permanent, depending on how suitable the habitat conditions are (temperature, food availability, and substrate) and whether oceanographic features (fronts, currents) keep larval stages in the vicinity of the spawning population. Bottom currents stronger than 25 cm/sec (half a knot) inhibit feeding. Growth of adult scallops is optimal between 10 and 15°C and they prefer full strength seawater.

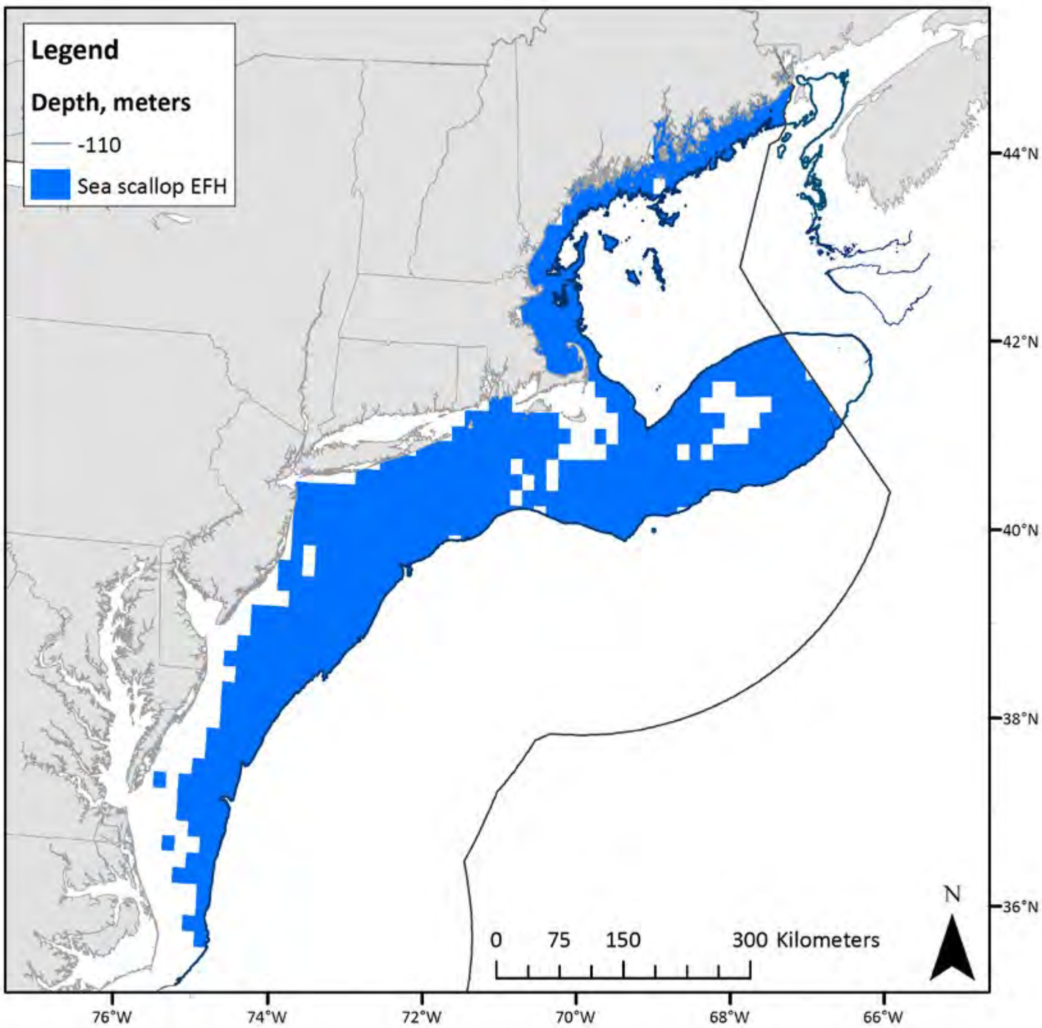
Table 29 – Atlantic sea scallop EFH designation for estuaries and embayments

Estuaries and Embayments	Eggs	Larvae	Juvenile	Adults
Passamaquoddy Bay	S	S	S	S
Englishman/Machias Bay	S	S	S	S
Narraguagus Bay	S	S	S	S
Blue Hill Bay	S	S	S	S
Penobscot Bay	S	S	S	S
Muscongus Bay	S	S	S	S
Damariscotta River	S	S	S	S
Sheepscot River	S	S	S	S
Casco Bay	S	S	S	S
Great Bay			S	S

Estuaries and Embayments	Eggs	Larvae	Juvenile	Adults
Massachusetts Bay	S	S	S	S
Cape Cod Bay	S	S	S	S

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).

Map 97 – Atlantic sea scallop EFH, all life stages.



2.2.6 Atlantic herring

Although herring are a pelagic species, their eggs are deposited in mats on the seafloor. The proposed Atlantic herring egg EFH designation includes two sources of information:

(1) Ten minute squares where larvae <=10mm were found in various ichthyoplankton surveys conducted between 1971 and 2013[37]. Mapped squares encompass the top 50% of larval abundance. Herring larvae hatch at between 4 and 10 mm total length (Fahay 2007), so larvae that are 10 mm or smaller in size are expected to be close to the location where their eggs were incubated.
(2) Observations of herring eggs on seafloor, identified based on a review of all available information on current and historical observations (see Appendix B).

The proposed EFH map for larval Atlantic herring is based on the relative abundance of larvae during 1978-1987 in the MARMAP ichthyoplankton surveys at the 90th percentile area level and ELMR bays and estuaries where herring larvae were identified as being "common" or abundant." More recent larval survey data used in the EFH map for eggs were not used in the larval map. The larval map is the same map used in the No Action alternative, but without any filled in squares.

The proposed EFH designation map differs from the no action map in that it includes additional areas where small larvae were found, and eliminates "filled in" ten minute squares. The map proposed in 2007 focused on the egg bed locations and ELMR embayments and did not include a comprehensive analysis of current larval data. The herring egg EFH domain is bounded at 40° N and 71° 30' W. Herring are not known to spawn south or west of Nantucket Shoals.

The proposed EFH designations for juvenile and adult Atlantic herring are based upon average catch per tow at the 75th percentile of area level in ten minute squares of latitude and longitude in the 1968-2005 fall and spring NMFS trawl survey data, plus several squares that either were not surveyed, or that the Council's Habitat Committee determined were not well represented in the survey data.[38] The proposed new EFH maps also include ten minute squares in inshore areas where juvenile or adult Atlantic herring were caught in state trawl surveys in more than 10% of the tows, as well as those bays and estuaries identified by the NOAA ELMR program where they were "common" or "abundant." A few more ten minute squares on the coasts of Maine, Connecticut, and Rhode Island that were either unsurveyed (fewer than four tows) or identified by fishing industry members of the Habitat Committee were also added to both maps. These designations were referred to as Juvenile/Adult Alternative 2E in the Phase 1 DEIS.

The proposed EFH designation map for Atlantic herring eggs covers much more seafloor than the no action map, extending more broadly into the Great South Channel and on Nantucket Shoals and Georges Bank. The depth range was slightly expanded from 20-80 meters to 5-90 meters.[39] The proposed EFH maps for juveniles and adults extend over the same geographic area as the no action maps, but include more ten minute squares. The most significant changes are in the proposed EFH descriptions, both of which define a much broader depth range (0 to 300

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[37] ICNAF 1971-1978, MARMAP 1977-1994, GLOBEC 1995-1999, and EcoMon 1992-present (data through May 2013)

[38] Because Atlantic herring are pelagic, like eggs and larvae of other managed species, this is the only species for which percent area instead of percent catch was used to map EFH for juveniles and adults (see explanation in Appendix A).

[39] As with all the proposed EFH text descriptions, the depth ranges are now a required component of the EFH designation and are no longer "generally" applicable.

m and, for the juveniles, include the intertidal zone). Also, the juvenile EFH description includes some temperature and salinity information specific to young-of-the-year juveniles.

Text descriptions:

Essential fish habitat for Atlantic herring (*Clupea harengus*) is designated anywhere within the geographic areas that are listed in Table 30 and the following maps which exhibit the environmental conditions defined in the text descriptions.

Eggs: Inshore and offshore benthic habitats in the Gulf of Maine and on Georges Bank and Nantucket Shoals in depths of 5 – 90 meters on coarse sand, pebbles, cobbles, and boulders and/or macroalgae at the locations shown in Map 98. Eggs adhere to the bottom, often in areas with strong bottom currents, forming egg “beds” that may be many layers deep.

Larvae: Inshore and offshore pelagic habitats in the Gulf of Maine, on Georges Bank, and in the upper Mid-Atlantic Bight, as shown on Map 99, and in the bays and estuaries listed in Table 30. Atlantic herring have a very long larval stage, lasting 4-8 months, and are transported long distances to inshore and estuarine waters where they metamorphose into early stage juveniles (“brit”) in the spring.

Juveniles: Intertidal and sub-tidal pelagic habitats to 300 meters throughout the region, as shown on Map 100, including the bays and estuaries listed in Table 30. One and two-year old juveniles form large schools and make limited seasonal inshore-offshore migrations. Older juveniles are usually found in water temperatures of 3 to 15°C in the northern part of their range and as high as 22°C in the Mid-Atlantic. Young-of-the-year juveniles can tolerate low salinities, but older juveniles avoid brackish water.

Adults: Sub-tidal pelagic habitats with maximum depths of 300 meters throughout the region, as shown on Map 100, including the bays and estuaries listed in Table 30. Adults make extensive seasonal migrations between summer and fall spawning grounds on Georges Bank and the Gulf of Maine and overwintering areas in southern New England and the Mid-Atlantic region. They seldom migrate beyond a depth of about 100 meters and – unless they are preparing to spawn – usually remain near the surface. They generally avoid water temperatures above 10°C and low salinities. Spawning takes place on the bottom, generally in depths of 5 – 90 meters on a variety of substrates (see eggs).

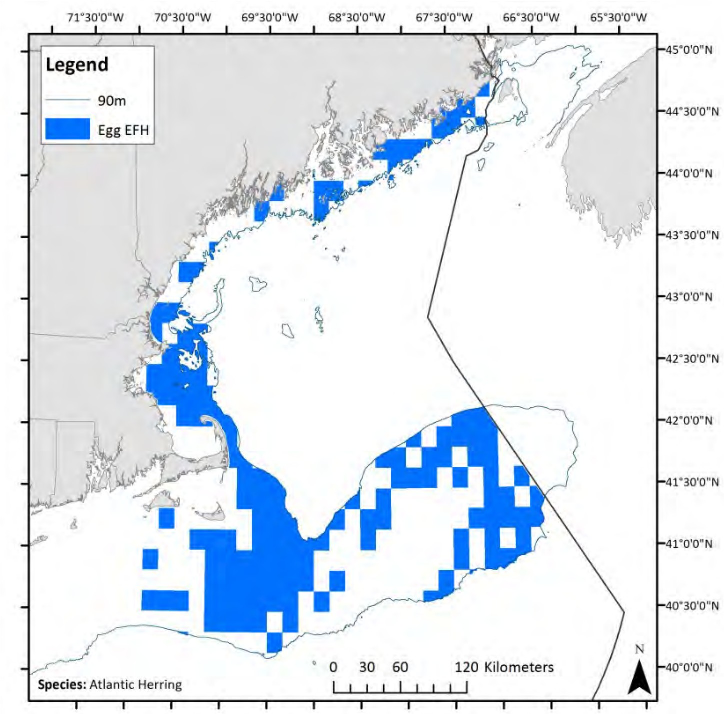
Table 30 – Atlantic herring EFH designation for estuaries and embayments.

Estuaries and Embayments	Larvae	Juveniles	Adults
Passamaquoddy Bay	S,M	S,M	S,M
Englishman/Machias Bay	S,M	S,M	S,M
Narraguagus Bay	S,M	S,M	S,M
Blue Hill Bay	S,M	S,M	S,M
Penobscot Bay	S,M	S,M	S,M
Muscongus Bay	S,M	S,M	S,M

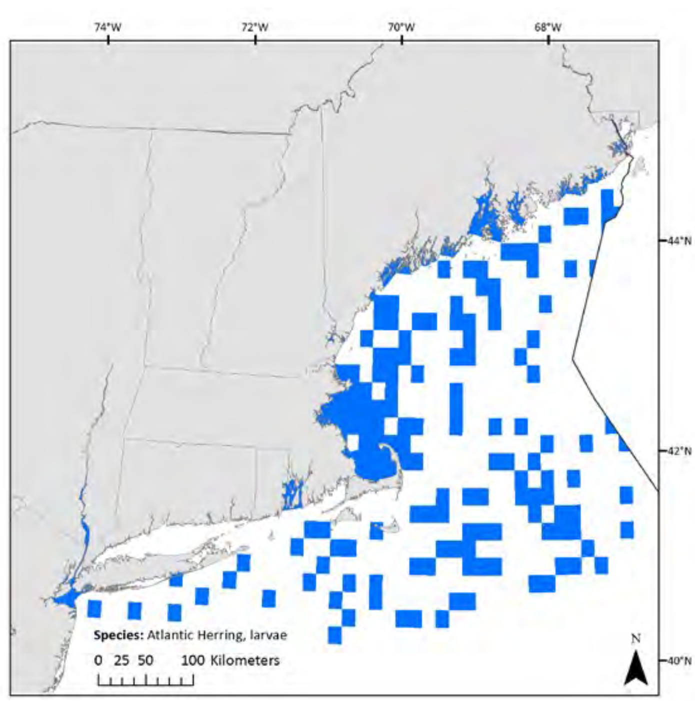
Estuaries and Embayments	Larvae	Juveniles	Adults
Damariscotta River	S,M	S,M	S,M
Sheepscot River	S,M	S,M	S,M
Kennebec / Androscoggin	S,M	S,M	S,M
Casco Bay	S,M	S,M	S
Saco Bay	S,M	S,M	S
Wells Harbor	S,M	S,M	S
Great Bay	S,M	S,M	S
Hampton Harbor*	S,M	S,M	S
Merrimack River	M	M	
Plum Island Sound*	S,M	S,M	S
Massachusetts Bay	S	S	S
Boston Harbor	S	S,M	S,M
Cape Cod Bay	S	S,M	S,M
Buzzards Bay		S,M	S,M
Narragansett Bay	S	S,M	S,M
Long Island Sound		S,M	S,M
Gardiners Bay		S	S
Great South Bay		S	S
Hudson River / Raritan Bay	S,M	S,M	S,M
Barnegat Bay		S,M	S,M
New Jersey Inland Bays		S,M	S,M
Delaware Bay		S,M	S
Chesapeake Bay			S

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).
** = This water body was not included in the original ELMR reports, but it was included in the salinity zone maps that were appended to all the relevant fishery management plans and amendments which implemented the no action EFH designations; EFH designations were inferred in these locations if there were ELMR-based designations in the adjacent north and south locations.*

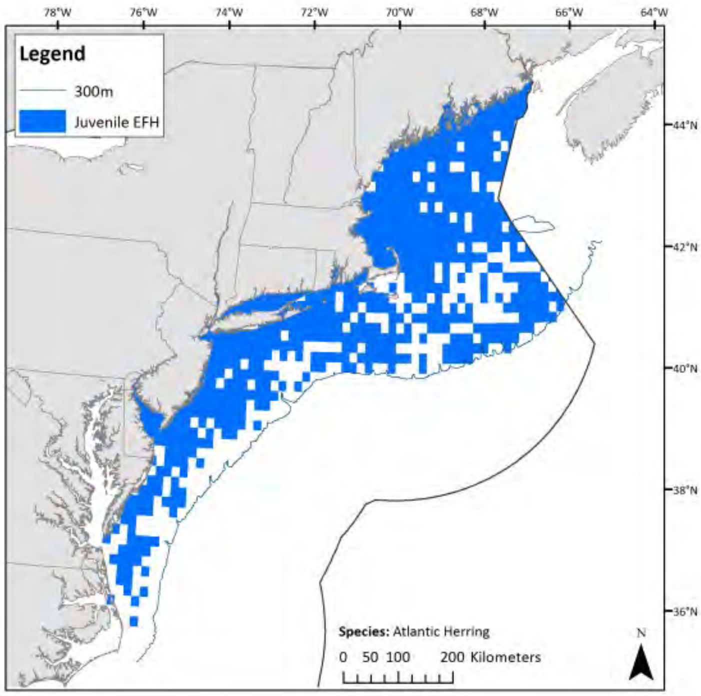
Map 98 – Atlantic herring egg EFH.



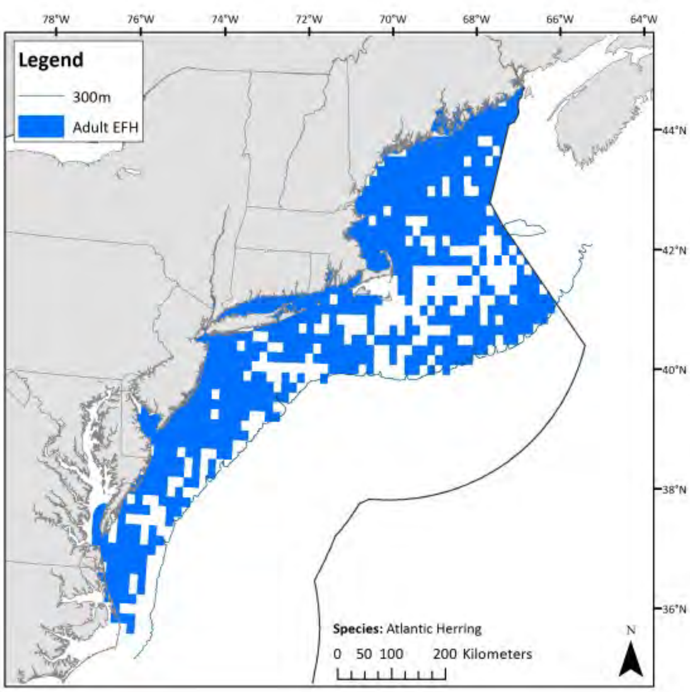
Map 99 – Atlantic herring larval EFH.



Map 100 – Atlantic herring juvenile EFH.



Map 101 – Atlantic herring adult EFH.



2.2.7 Deep-sea red crab

The proposed EFH designations for deep-sea red crab are based on a re-evaluation of published size and sex-specific data collected during a 1974 NMFS deep-water trawl survey that were also used in 2002 to develop the original designations, and on new observations of red crabs on two seamounts (see Appendix B). As with the no action designations, the proposed egg EFH designation is based on the depth range where catches of female crabs were higher, larval EFH extends over the depth range where the juveniles and adults were most commonly caught, juvenile EFH corresponds to the depth range where juveniles were most common, and adult EFH to a more restricted depth range where adults were most common. The proposed designations for larvae, juveniles, and adults also include the portions of two seamounts that are above the maximum depth where red crabs have been observed in remotely-operated underwater vehicle surveys. [40] Red crabs also inhabit the Gulf of Maine, but it was not included in the proposed designations because there was no information available to indicate any depth preferences. The proposed egg designation was referred to as Alternative 2 in the Phase 1 DEIS[41] and the designations for larvae, juveniles, and adults as Alternative 3A.

The depth range in the proposed EFH designation for adult red crabs is more restricted than the no action designation and starts in slightly deeper water (320-900 m versus 200-1300 m), which would have the effect of shifting EFH more completely off the shelf and into the continental slope. The proposed EFH for juvenile red crabs would extend over a wider depth range than EFH for the adults (about 1000 vs 600 m) and, compared to the no action designation, start and end in shallower water (320-1300 vs 700-1800 m). The proposed EFH for red crab eggs is also slightly different (320-640 m) than the no action designation (200-400 m).

Text descriptions:

Essential fish habitat for red crab (*Chaceon quinquedens*) is designated anywhere within the geographic areas that are shown on the following maps which exhibit the environmental conditions defined in the text descriptions.

Eggs: Red crab eggs are brooded attached to the underside of female crabs until they hatch into larvae and are released into the water column. The EFH designation for red crab eggs is the same as the known distribution of egg-bearing females (320 – 640 meters) along the outer continental shelf and slope, as shown on Map 102.

Larvae: Near-surface water habitats on the outer continental shelf and slope and over Bear and Retriever seamounts across the entire depth range identified for the species (320 - 1300 meters on the slope and down to 2000 meters on the seamounts), as shown on Map 103.

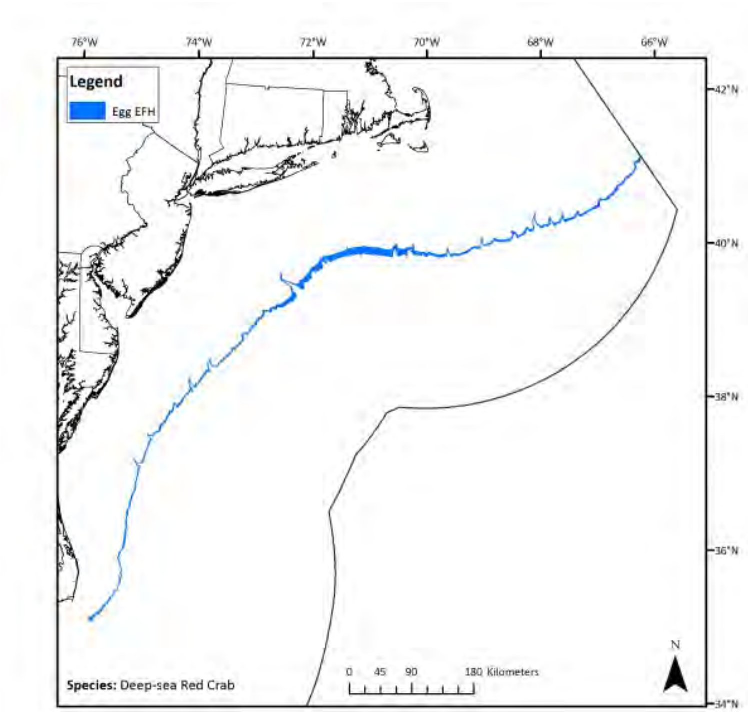
[40] Red crabs are the only species with EFH on the seamounts

[41] Note that the Habitat Committee approved the No Action alternative during Phase 1 because no new information relating to the depth distribution of female red crabs on the continental slope was available, but Alternative 2 should have been selected because the depth range was revised based on a re-analysis of the 1974 survey data.

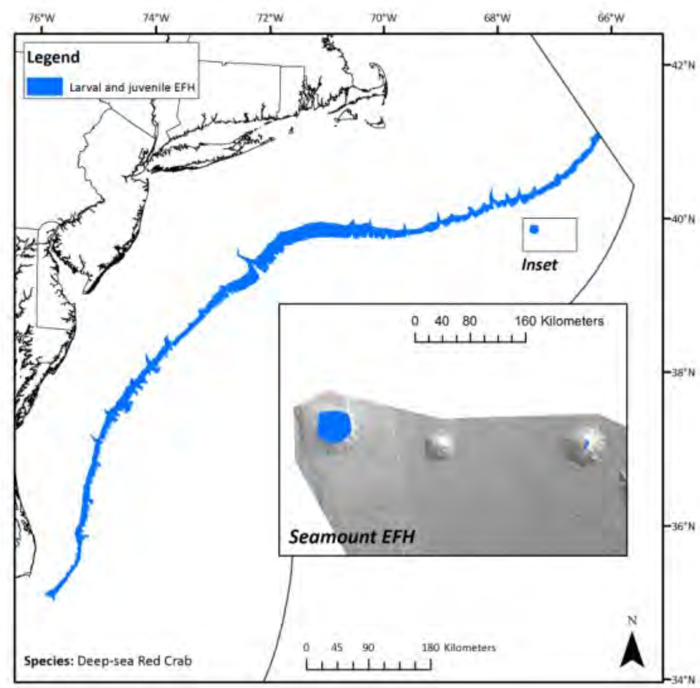
Juveniles: Bottom habitats with unconsolidated and consolidated silt-clay sediments at depths of 320 - 1300 meters in submarine canyons and on the continental slope, and to a maximum depth of 2000 meters on Bear and Retriever seamounts, as shown on Map 103.

Adults: Bottom habitats with unconsolidated and consolidated silt-clay sediments at depths of 320 - 900 meters in submarine canyons and on the continental slope, and to a maximum depth of 2000 meters on Bear and Retriever seamounts, as shown on Map 104. Red crabs generally spawn on the slope at depths of 320 – 640 meters.

Map 102 – Deep-sea red crab egg EFH.

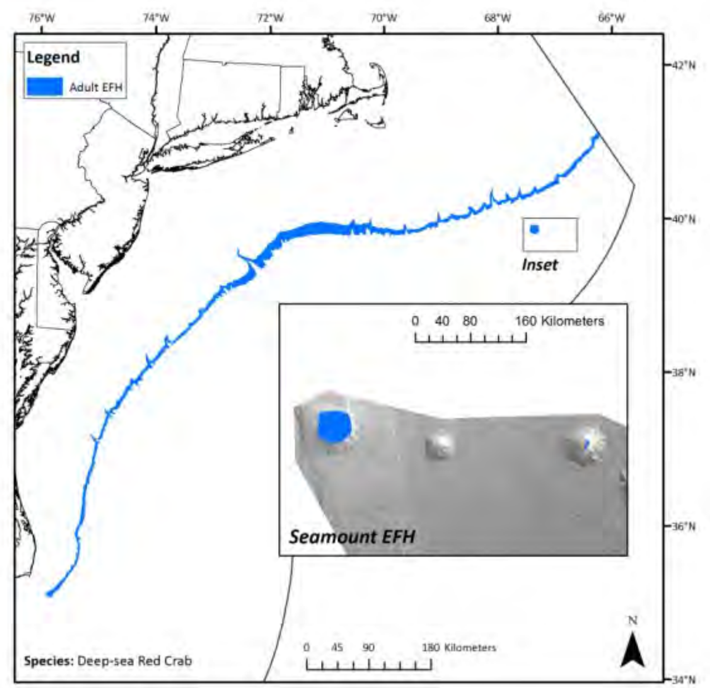


Map 103 – Deep-sea red crab larval and juvenile EFH.



Hill-shaded bathymetry in the inset shows the seamounts (Bear is on the left, Retriever is on the right).

Map 104 – Deep-sea red crab adult EFH.



Hill-shaded bathymetry in the inset shows the seamounts (Bear is on the left, Retriever is on the right).

2.2.8 Atlantic salmon

The proposed EFH designation for Atlantic salmon includes the rivers, estuaries, and bays that are listed in Table 31 and shown in Map 105, which exhibit the environmental conditions defined in the text descriptions. There are two proposed text descriptions, one for fresh water spawning and rearing habitats and one for habitats used during migrations to and from the ocean, each with up-dated information specific to certain life history stages. Under the preferred alternative, smaller tributaries not shown on the map would also be EFH for one or more life stage as long as they conform to the proposed habitat descriptions. All river systems proposed for designation form a direct connection to the sea, but EFH would not include portions of rivers above naturally occurring barriers to upstream migration or land-locked lakes and ponds. The oceanic component of EFH would be limited to a distance of three miles from the mouth of each river. The proposed EFH designations that were approved by the Council in 2007 included all rivers and streams where the presence of returning adult salmon was documented in at least one year between 1996 and 2005 (see Appendix A for more details). The index numbers for each river used in Map 105 correspond to sub-region names and hydrologic unit codes (HUC) used by the U.S. Geological Survey.

Given the importance of these designations for EFH consultations on non-fishing activities that can affect riverine habitats used by Atlantic salmon in New England, the Habitat PDT reviewed more recent data for the years 2006-2013 provided in the 2014 annual report of the U.S. Atlantic

Salmon Assessment Committee (USASC 2014). The designations that were approved in 2007 were based on data provided in an earlier report (USASC 2006). The revised list of designated rivers also included any river or tributary defined for the purpose of protecting this endangered species within the Distinct Population Segment (DPS) of Atlantic salmon in Maine, and several rivers that are outside the DPS that were designated as EFH in 1998 and failed to meet the criterion used by the Council in 2007 because they are not regularly monitored for returning adults (see Table 31). The DPS of Atlantic salmon includes the five sub-regions north of the Saco River, but excludes Boyden Stream, and the St. Croix and Aroostook rivers and their tributaries in northern and eastern Maine (see Map 105).

The proposed designation includes six new drainage systems not included in the original list of 26 rivers that were designated in 1998. All of them are in the Maine coastal sub-region (Chandler, Indian, Pleasant, St. George, Medomak, and Pemaquid rivers). All told, there are 30 river systems in nine New England sub-regions being proposed for Atlantic salmon EFH. The no action EFH maps included a number of discrete coastal ten minute squares, whereas the proposed map includes a more continuous series of bays and areas adjacent to river mouths that are within three miles of the coast. Designated EFH in Long Island Sound has been reduced to small areas where the Connecticut and Pawcatuck Rivers empty into the sound, rather than taking up the entire sound. Also, a number of improvements are proposed for the text descriptions which would make the habitat requirements for each life stage more specific and applicable to three separate juvenile life stages (fry, parr, and smolts).

Text descriptions:

Essential fish habitat for Atlantic salmon (*Salmo salar*) is designated as the rivers, estuaries, and bays that are listed in Table 31 and shown in Map 105. Supplementary habitat-related information, including prey, for each life stage is summarized in Appendix B. The designated rivers and streams form a direct connection to the sea. Essential fish habitat for the freshwater life history stages of Atlantic salmon includes all rivers, streams, lakes, and ponds in each designated drainage system that exhibit the environmental conditions identified in the following essential fish habitat text descriptions. Smaller order tributaries that could meet the EFH requirements defined in the text descriptions are not shown in the map.

<u>Fresh Water Spawning and Rearing Habitats</u> - Riffle and run habitats in shallow, well-oxygenated, fresh water streams with gravel/rocky substrates, as well as pools and vegetated riverine areas of lower velocity. These habitats occur in a range from 1st order streams (headwaters) to some 3rd or 4th order streams with low temperatures within the watersheds of the rivers listed in Table 31 and shown in Map 105. All six life stages of Atlantic salmon utilize fresh water habitats either exclusively or at some point during their life history – eggs, larvae (alevins), recently-hatched juveniles (fry), older juveniles (parr and smolts), and spawning adults. Intra-gravel habitat in the stream bed is essential for Atlantic salmon eggs and alevins, whereas essential fish habitat for the juveniles and spawning adults is the stream itself. Only parr and smolts utilize non-riffle and run habitats. The following conditions generally apply where essential fish habitat for these six life stages is found.

Eggs: Grain size diameters of 2-64 mm, water depths of 17-76 cm, water temperatures of 0-16°C (6-7 optimal), intra-gravel water velocities above 20 cm/sec (53 optimal), dissolved oxygen concentrations above 3 mg/l (7 optimal), and pH above 4.0 (5.5 optimal). Eggs are deposited in nests (redds) in late October-November and are buried in the substrate to depths of 10-25 cm where they remain for 175-195 days before hatching.

Larvae: Grain size diameters of 2-64 mm, water depths of 17-76 cm, water temperatures of 0-16°C, intra-gravel water velocities above 20 cm/sec (53 optimal), and dissolved oxygen concentrations above 3 mg/l (7 optimal). Larvae remain in the substrate for about six weeks before emerging as fry in the spring.

Juveniles (fry, <5 cm TL): Grain size diameters of 15-64 mm and, for emerging fry, stream flow velocities below 20 cm/sec. Essential fish habitat conditions of depth and temperature for small, emerging fry are generally the same as for eggs and larvae, but larger fry disperse up to 5 km from redd sites and may be exposed to a wider range of habitat conditions.

Juveniles (parr, 5-10 cm TL): Water depths of 10-15 cm for parr <7 cm TL and 30-60 cm for larger parr, temperatures of 7-25°C, dissolved oxygen concentrations above 5 mg/l, and water velocities of 30-92 cm/sec.

Juveniles (smolts, 10-20 cm TL): Juveniles begin metamorphosis into smolts while still in fresh water, in preparation for downstream migration into brackish and fully saline seawater in the spring. The timing of downstream migration depends on a variety of factors, including temperature, salinity, and the physiological adaptations that make it possible for the smolts to tolerate higher salinity.

Spawning adults: Grain size diameters of 2-64 mm, water depths of 17-76 cm, and temperatures of 4-14°C. Spawning in U.S. waters generally occurs during late October through November. Essential fish habitat for spawning adult salmon also includes coastal marine, estuarine, lacustrine, and riverine habitats used during upstream migration (see below).[42]

<u>Emigration-Immigration Habitats</u> – A variety of riverine, lacustrine, estuarine, and coastal marine habitats used by older juvenile Atlantic salmon (smolts, >10 cm TL) during their downstream migration to the sea, by mature adult salmon during their upstream spawning migration, and by spent adults (kelts) following spawning, before they return to the ocean. Essential fish habitat for migrating smolts and kelts includes streams, rivers, and estuaries from 1st to 5th order, as well as lakes, ponds, and impoundments, within the watersheds of the rivers listed in Table 31 and shown in Map 105. Essential fish habitat for all three life stages is generally characterized by salinities below 25 ppt. Transit habitats utilized during upstream and downstream migration include streams, rivers, and estuaries from 1st to 5th order, as well as coastal marine areas adjacent to the mouths of designated rivers and estuaries within state waters (3 miles).

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[42] All spawning females are sea-run salmon, but spawning males include some sea-run salmon and some juveniles that mature in fresh water before ever migrating to the ocean.

Table 31 –New England rivers, streams, and estuaries (bays) designated as EFH for Atlantic salmon, based on documented presence of adults during 2004-2013, geographic location as part of the Gulf of Maine Distinct Population Segment (DPS), or as a river that was designated in 1998 (a Status Quo river) and is not regularly monitored.

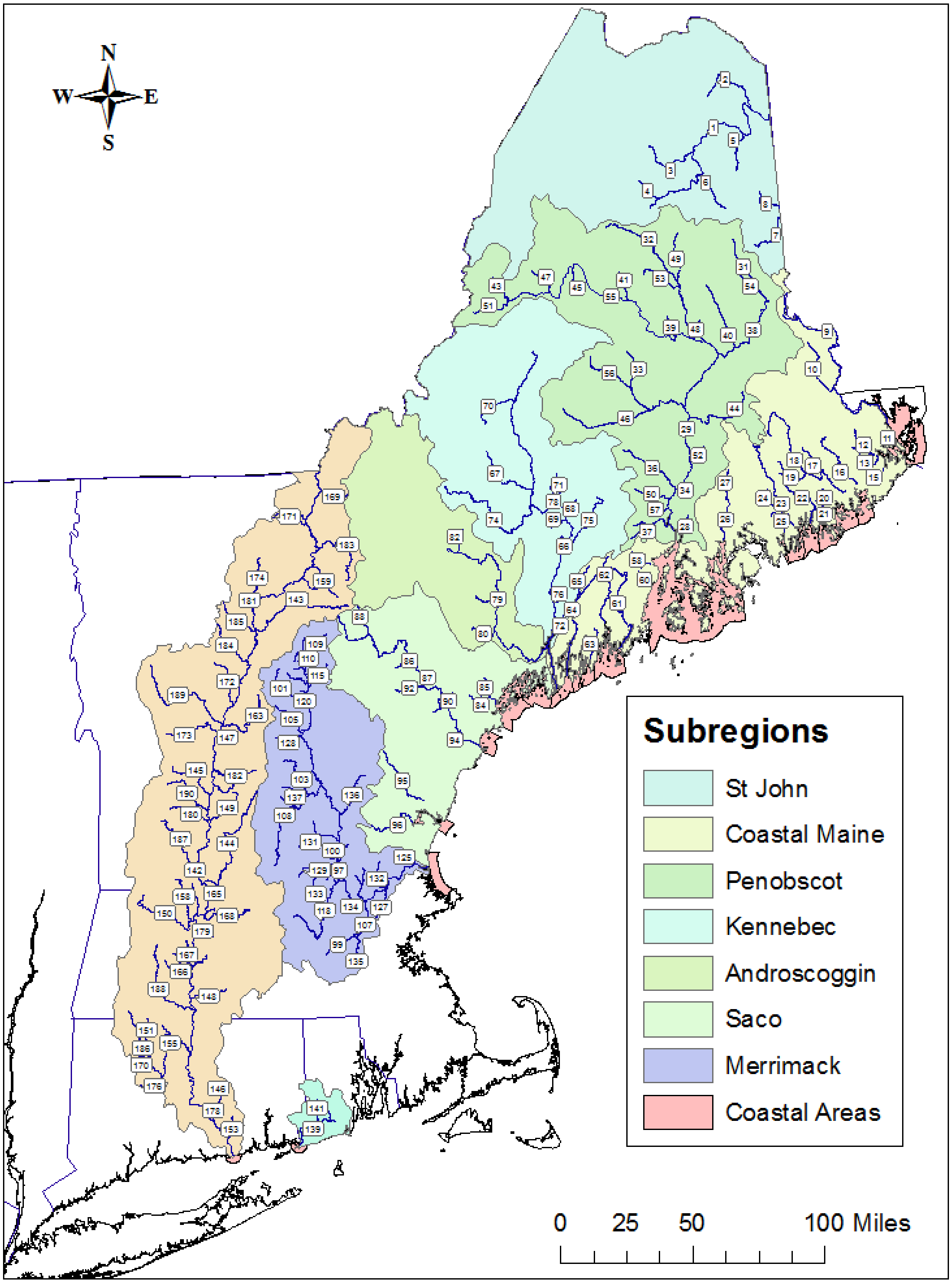
Sub-region, hydrologic unit code, and drainage	Rivers and indices	Bay designation	Years present	DPS?	SQ?
St John, 0101, St John	Aroostook River (1), Little Madawaska River (2), Big Machias River (3), Mooseleuk Stream (4), Presque Isle Stream (5), St Croix Stream (6). Meduxnekeag River (7), N Branch Meduxnekeag River (8)	Bay of Fundy	No data	No	Yes
Maine Coastal, 0105, St Croix	St Croix River (9), Tomah Stream (10)	Passamaquoddy Bay	1996-2005, every year; no data after 2005	No	Yes
Maine Coastal, 0105, Boyden	Boyden Stream (11)	Cobscook Bay	No data	No	Yes
Maine Coastal, 105, Dennys	Dennys River (12), Cathance Stream (13)	Cobscook Bay	13 yrs during 1996-2011	Yes	Yes
Maine Coastal, 105, Hobart	Hobart Stream (14), Orange River (15)	Cobscook Bay	No data	Yes	Yes
Maine Coastal, 105, East Machias	East Machias River (16)	Machias Bay	1967-1995; no data after 1995	Yes	Yes
Maine Coastal, 105, Machias	Machias River (18), Mopang Stream (19), Old Stream (17)	Machias Bay	1967-1995; no data after 1995	Yes	Yes
Maine Coastal, 105, Chandler	Chandler River (20)	Englishman, Chandler Bays	No data	Yes	Yes
Maine Coastal, 105, Indian	Indian River (21)	Western Bay	No data	Yes	Yes
Maine Coastal, 105, Pleasant	Pleasant River (22)	Narraguagas, Pleasant Bays	1967-1995, 7 yrs 1996-2013	Yes	Yes
Maine Coastal, 105, Narraguagus	Narraguagus River (23), West Branch Narraguagus River (24)	Narraguagas, Pleasant Bays	1996-2013, every year	Yes	Yes
Maine Coastal, 105, Tunk	Tunk Stream (25)	Gouldsboro Bay	No data	Yes	Yes
Maine Coastal, 105, Union	Union River (26), West Branch Union River (27)	Blue Hill Bay	8 yrs during 1996-2005; 1 return in 2013	Yes	Yes
Penobscot, 102, Orland	Orland River (28)	Penobscot Bay	No data	Yes	Yes
Penobscot, 102, Penobscot	Penobscot River (29), Cove Brook (30), East Branch Mattawamkeag River (31), East Branch Penobscot R (32), East Branch Pleasant R (33), Eaton Brook (34), Felts Brook (35), Kenduskeag Stream (36), Marsh Stream (37), Mattawamkeag River (38), Millinocket Stream (39), Molunkus Stream (40), Nesowadnehunk Stream (41), North Branch Marsh Stream (42), North Branch Penobscot R (43), Passadumkeag River (44), Pine Stream (45), Piscataquis River (46), Russell Stream (47), Salmon Stream (48), Seboeis River	Penobscot Bay	Every year 1996-2013	Yes	Yes

Sub-region, hydrologic unit code, and drainage	Rivers and indices	Bay designation	Years present	DPS?	SQ?
	(49), South Branch Penobscot River (50), Souadabscook Stream (51), Sunkhaze Stream (52), Wassataquoik Stream (53), West Branch Mattawamkeag River (54), West Branch Penobscot R (55), West Branch Pleasant River (56), West Branch Souadabscook Stream (57)				
Maine Coastal, 105, Passagassawakeag	Passagassawakeag River (58), Little River (59)	Penobscot Bay	No data	Yes	Yes
Maine Coastal, 105, Ducktrap	Ducktrap River (60)	Penobscot Bay	1985-1995; no data after 1995	Yes	Yes
Maine Coastal, 105, St George	St George River (61)	Muscongus Bay	No data	Yes	Yes
Maine Coastal, 105, Medomak	Medomak River (62)	Muscongus Bay	No data	Yes	Yes
Maine Coastal, 105, Pemaquid	Pemaquid River (63)	Johns Bay	No data	Yes	Yes
Maine Coastal, 105, Sheepscot	Sheepscot River (64), West Branch Sheepscot River (65)	Sheepscot Bay	1967-1997; no data after 1997	Yes	Yes
Kennebec, 103, Kennebec	Kennebec River (66), Carrabassett River (67), Carrabassett Stream (68), Craigin Brook (69), Dead River (70), East Branch Wesserunsett Stream (71), Eastern River (72), Messalonskee Stream (73), Sandy River (74), Sebasticook River (75), Togus Stream (76), Wesserunsett Stream (77), West Branch Wesserunsett Stream (78)	Local Estuary	2006-2013; no data 1996-2005	Yes	Yes
Androscoggin, 104, Androscoggin	Androscoggin River (79), Little Androscoggin River (80), Nezinscot River (81), Webb River (82)	Local Estuary	1996-2013, every year	Yes	Yes
Saco, 106, Presumpscot	Presumpscot River (83), Mill Brook (84), Piscataqua River (85)	Casco Bay	No data	No	Yes
Saco, 106, Saco	Saco River (86), Breakneck Brook (87), Ellis River (88), Hancock Brook (89), Josies Brook (90), Little Ossipee River (91), Ossipee River (92), Shepards River (93), Swan Pond Brook (94)	Saco Bay	1996-2013 every year	No	Yes
Saco, 106, Cocheco	Cocheco River (95)	Great Bay	4 yrs during 1996-2003; no data after 2003	No	Yes
Saco, 106, Lamprey	Lamprey River (96)	Great Bay	4 yrs during 1996-2003; no data after 2003	No	Yes
Merrimack, 107, Merrimack	Merrimack River (97), Amey Brook (98), Assabet River (99), Baboosic Brook (100), Baker River (101), Bartemus Brook (123), Beaver Brook (102), Blackwater River (103), Bog Brook (104), Cockermouth River (105), Cohas Brook (106), Concord River (107), Contoocook River (108), E Branch Pemigewasset R (109), Eastman Brook (110), Glover Brook (111), Golden Brook (112), Hubbard Brook (113), Jackman Brook (114), Mad	Ipswich Bay	1996-2013, every year	No	Yes

Sub-region, hydrologic unit code, and drainage	Rivers and indices	Bay designation	Years present	DPS?	SQ?
	River (115), Mill Brook (116), Moosilauke Brook (117), Nashua River (118), Nissitissit River (119), Pemigewasset River (120), Pennichuck Brook (121), Piscataquog River (124), Powwow River (125), Pulpit Brook (126) Shawseen River (127), Smith River (128), Souhegan River (129), South Branch Baker River (130), S Branch Piscataquog R (131), Spicket River (132), Squannacook River (133), Stony Brook (134), Sudbury River (135) Suncook River (136), Warner River (137) West Branch Brook (138), Witches Brook (122)				
MA-RI Coastal, 109, Pawcatuck	Pawcatuck River (139), Beaver River (140), Wood River (141)	Long Island Sound	13 yrs during 1996-2013	No	Yes
Connecticut, 108, Connecticut	Connecticut River (142), Ammonoosuc River (143), Ashuelot River (144), Black River (145), Blackledge River (146), Bloods Brook (147), Chicopee River (148), Cold River (149), Deerfield River (150), East Branch Farmington R (151), East Branch Salmon Brook (152), Eight Mile River (153), Fall River (154), Farmington River (155), Fort River (156), Four Mile Brook (157) Green River (158), Israel River (159), Johns River (160), Little Sugar River (161), Manhan River (162), Mascoma River (163), Mill Brook (165), Mill River (Hatfield) (166), Mill River (Northampton) (167), Millers River (168), Mohawk River (169), Nepaug River (170), North Branch Manhan R (164), Nulhegan River (171), Ompompanoosuc River (172), Ottauquechee River (173), Passumpsic River (174), Paul Stream (175) Pequabuck River (176), Salmon Brook (177), Salmon River (178), Sawmill River (179), Saxtons River (180), Stevens River (181), Sugar River (182) Upper Ammonoosuc River (183), Waits River (184), Wells River (185), West Branch Farmington R (186), West River (187), Westfield River (188), White River (189), Williams River (190)	Long Island Sound	1996-2013, every year	No	Yes

[a] EFH does not include Canadian waters in the Bay of Fundy or Passamaquoddy Bay.

Map 105 – Atlantic salmon EFH, all lifestages.



3.1 Preferred Alternative Habitat Area of Particular Concern designations

3.1.1 Atlantic salmon HAPC (No Action, preferred)

Seven small, coastal drainages located in the downeast and mid-coast sections of Maine hold the last remaining populations of native Atlantic salmon in the United States (USFWS 1996). These important rivers are the Dennys, Machias, East Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot. In 1998 (Omnibus EFH Amendment 1), the Council concluded that the designation of the following eleven rivers in Maine met at least two criteria for designation as a Habitat Areas of Particular Concern for Atlantic salmon: Dennys, Machias, East Machias, Pleasant, Narraguagus, Ducktrap, Sheepscot, Kennebec, Penobscot, St. Croix, and Tunk Stream (Map 242 and Map 243 show the western and eastern rivers, respectively).

Important ecological function?	Yes
Sensitive to anthropogenic stress?	Yes
Presence of current or future stresses?	Yes
Rarity?	No
Improve fisheries management?	No
EFH desingation for more than one species?	No
Juvenile cod EFH?	No
More than one final rule criteria?	Yes

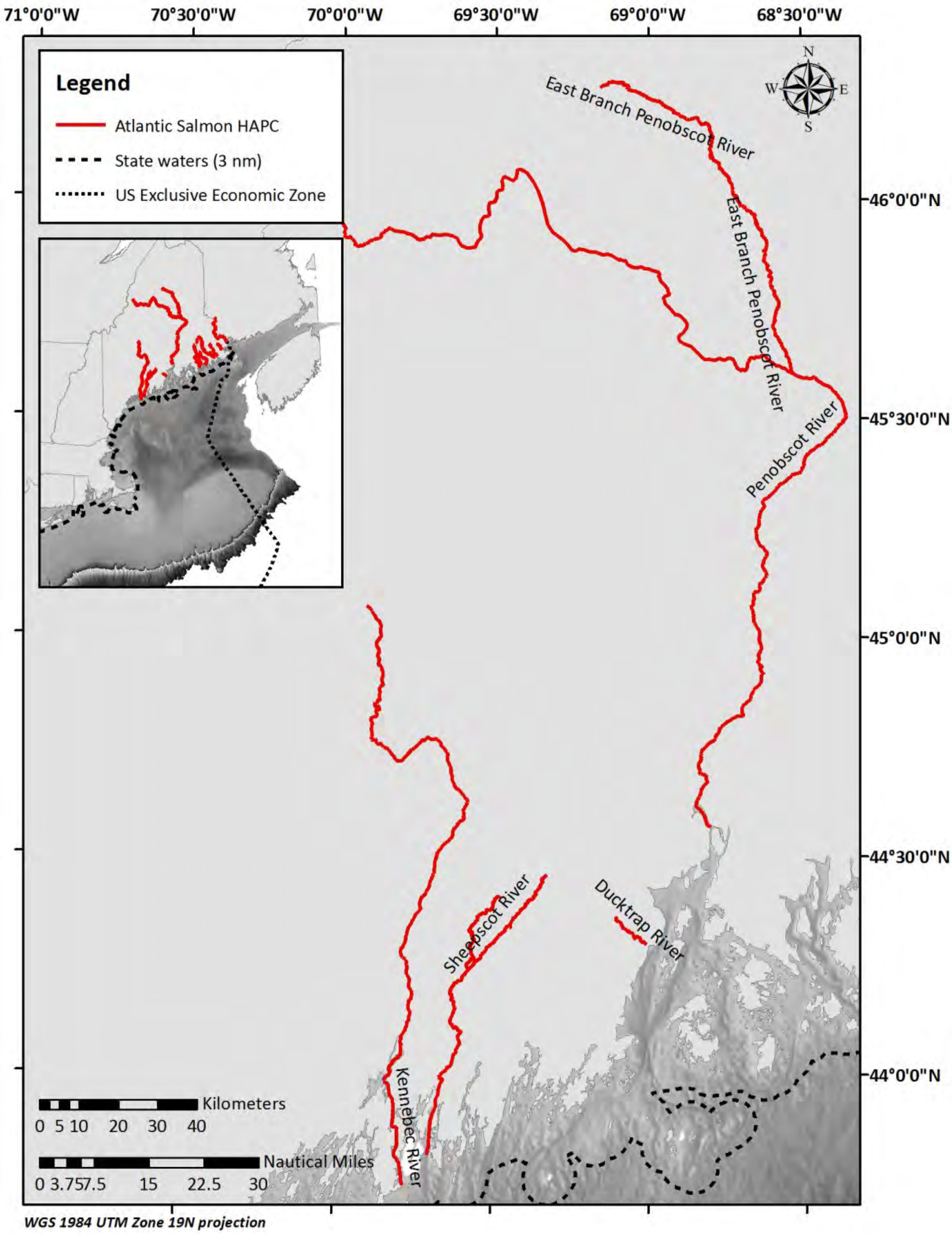
Rationale: The U.S. Fish and Wildlife Service (USFWS) and NMFS listed the Gulf of Maine Distinct Population Segment (DPS) of Atlantic salmon as endangered on July 20, 2009. A DPS is a population of vertebrates that is discrete and ecologically significant. According to USFWS:

> "[T]he GOM DPS includes all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, and wherever these fish occur in the estuarine and marine environment. The following impassable falls delimit the upstream extent of the freshwater range: Rumford Falls in the town of Rumford on the Androscoggin River; Snow Falls in the town of West Paris on the Little Androscoggin River; Grand Falls in Township 3 Range 4 BKP WKR, on the Dead River in the Kennebec Basin; the un-named falls (impounded by Indian Pond Dam) immediately above the Kennebec River Gorge in the town of Indian Stream Township on the Kennebec River; Big Niagara Falls on Nesowadnehunk Stream in Township 3 Range 10 WELS in the Penobscot Basin; Grand Pitch on Webster Brook in Trout Brook Township in the Penobscot Basin; and Grand Falls on the Passadumkeag River in Grand Falls Township in the Penobscot Basin. The marine range of the GOM DPS extends from the Gulf of Maine, throughout the Northwest Atlantic Ocean, to the coast of Greenland. Included are all associated conservation hatchery populations used to supplement these natural populations; currently, such conservation hatchery populations are maintained at Green Lake National Fish Hatchery (GLNFH) and Craig Brook National Fish Hatchery (CBNFH). Excluded are landlocked salmon and those salmon raised in commercial hatcheries for aquaculture."

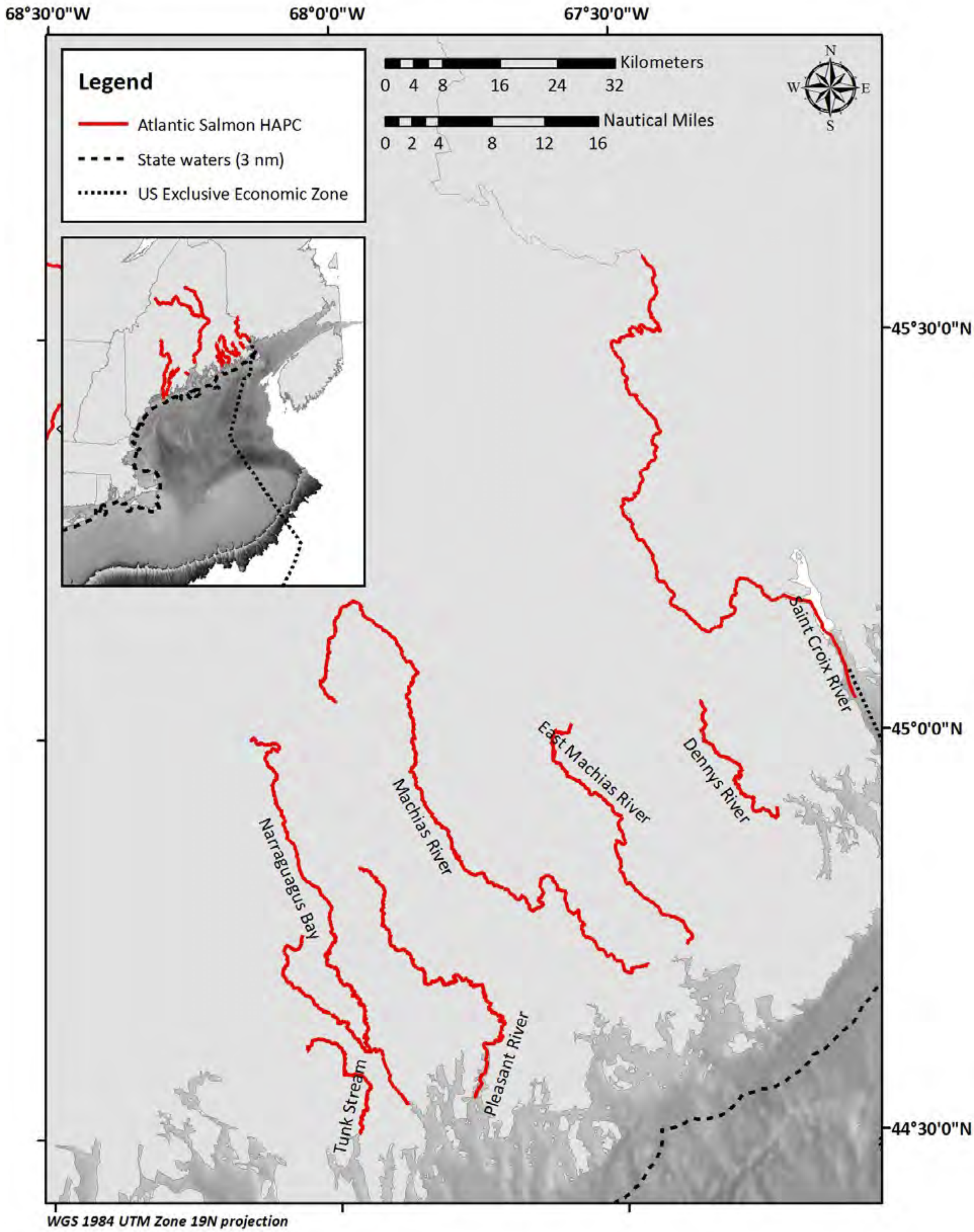
By supporting the only remaining U.S. populations of naturally spawning Atlantic salmon that have historic river-specific characteristics, these rivers provide an important ecological function. These river populations harbor an important genetic legacy that is vital to the persistence of these populations and to the continued existence of the species in the United States. These riverine habitats, although not rare, are sensitive to anthropogenic stresses, from dam construction and hydropower operations to logging, agriculture, and aquaculture activities. Human activities can threaten the ability of Atlantic salmon to migrate upriver to the spawning habitat, the quality and quantity of the spawning and rearing habitat, and the genetic integrity of the native populations contained in the rivers. While Atlantic salmon are subject to a Recovery Program and General Conservation Plan as an Endangered Species Act listed species, such anthropogenic stresses are ongoing and likely to continue into the future.

The HAPC is not likely to improve fisheries management in the EEZ, as there is no commericial or recreational fishery for the species, but it may help to rebuilding the Atlantic salmon population by lending importance to conservation recommendations developed during the EFH consultation process. The only EFH designation overlapping this HAPC is the Atlantic salmon designation.

Map 242 – Atlantic salmon HAPC, western rivers



Map 243 – Atlantic salmon HAPC, eastern rivers



3.1.2 Northern Edge Juvenile Cod HAPC (No Action, preferred)

The Northern Edge Juvenile Cod HAPC (Map 244) was designated via EFH Omnibus Amendment 1. Coordinates for the HAPC are provided below. Because the HAPC is designated for juvenile cod, it is by definition a subset of juvenile cod EFH. Assuming that the preferred alternative EFH designation is implemented, this means that the HAPC designation would only apply at depths up to 120 meters. This excludes the northwestern part of the area. Map 244 shows the overlap between the preferred juvenile cod EFH designation and the HAPC.

Point	W Longitude	N Latitude
CIIH1	67° 20'	42° 10'
CIIH2	67° 09.3'	42° 10'
CIIH3	67° 0.5'	42° 00'
CIIH4	67° 10'	42° 00'
CIIH5	67°10'	41° 50'
CIIH6	67° 20'	41° 50'

Important ecological function?	Yes
Sensitive to anthropogenic stress?	Yes
Presence of current or future stresses?	Yes
Rarity?	No
Improve fisheries management?	Yes
EFH desingation for more than one species?	Yes
Juvenile cod EFH?	Yes
More than one final rule criteria?	Yes

Rationale: The Northern Edge Juvenile Cod HAPC provides an important ecological function related ot the survival of post-settlement juvenile cod. Particular life history stages are sometimes considered ecological bottlenecks if they are associated with extremely high levels of mortality. High cod mortality rates during their post-settlement phase are attributed to high levels of predation (Tupper and Boutilier 1995). Several studies, some conducted in the field and some based on laboratory comparisons of survival by habitat type, document the importance of complex habitats (e.g. pebble/cobble/rock substrate, emergent epifauna, and/or seagrass) to the survival of these newly settled juveniles (Lough et al. 1989; Valentine and Lough 1991; Gotceitas and Brown 1993; Gotceitas et al 1995, Tupper and Boutilier 1995; Valentine and Schmuck 1995, Fraser et al. 1996, Lindholm et al. 1999). In particular a substrate of gravel or cobble, as compared to a less complex sand habitat, allows sufficient space for newly settled juvenile cod to find shelter and avoid predation (Lough et al. 1989; Valentine and Lough 1991; Gotceitas and Brown 1993; Tupper and Boutilier 1995; Valentine and Schmuck 1995). Presence of epifauna, especially at high densities, is an important contributor towards mortality reduction, as the epifauna may obstruct visual cues (Lindholm et al. 1999). Thus, protection of these habitat features may enhance survival through this bottleneck and thereby recruitment to the fishery.

Juvenile cod and gravel habitats with associated epifauna co-occur on the northern edge of Georges Bank. In particular, specific areas on the northern edge of Georges Bank have been extensively studied and identified as important areas forjuvenile cod survival (Lough et al. 1989; Valentine and Lough 1991; Valentine and Schmuck 1995, Lough 2010).

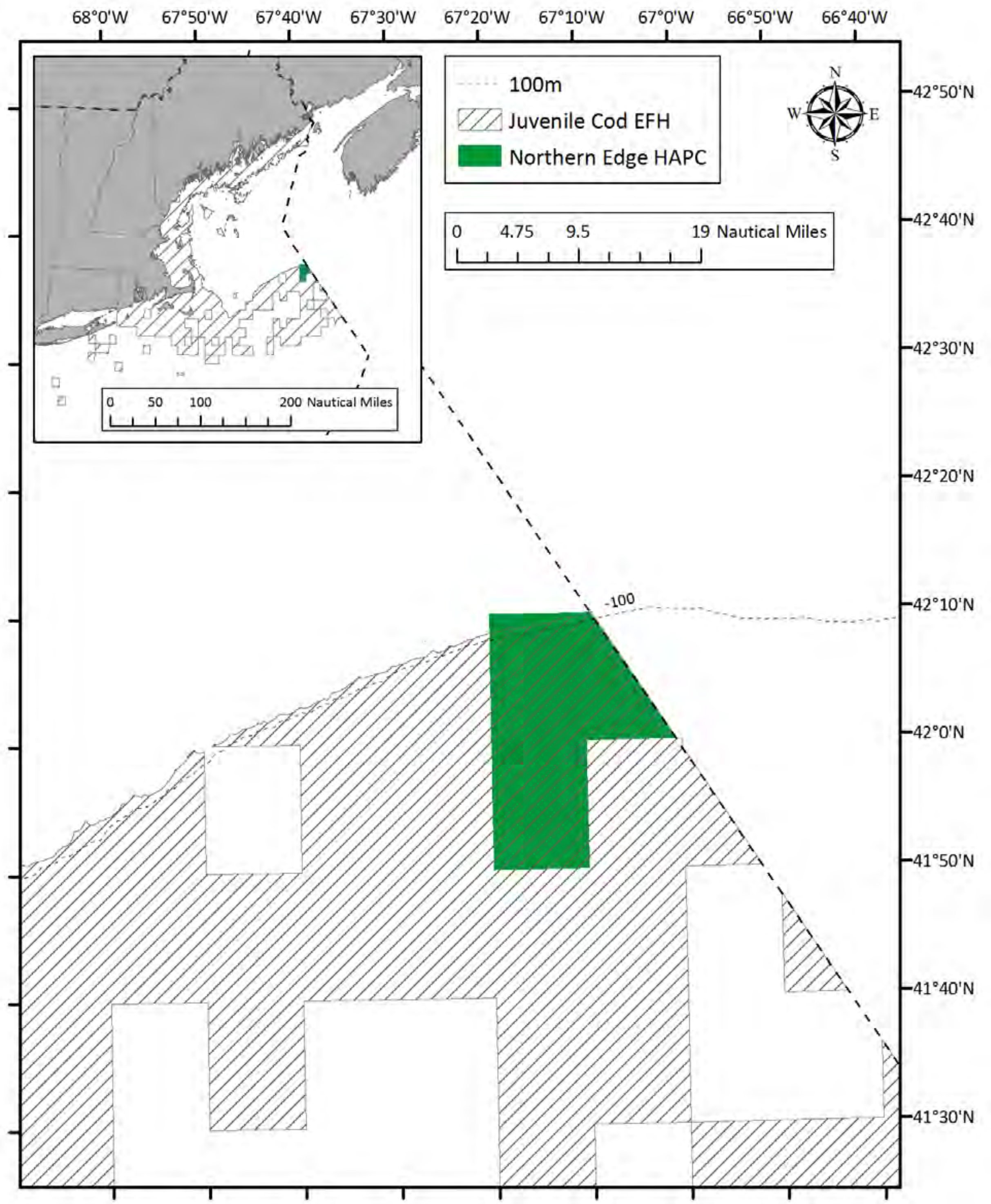
Fishing activity can alter the structure and therefore the function of gravel habitats in terms of their ability to provide quality shelter for juvenile cod. The HAPC has been designated as a groundfish closure since 1994, and as a habitat closure area since 2003 (Northeast Multispecies Amendment 13). Combining the measures associated with these two management areas, the HAPC is currently closed to mobile bottom-tending gears as well as fixed gears that catch groundfish (gillnets and longlines). A related series of studies (Collie et al. 1997, Collie et al. 2000, Hermsen et al. 2003, Collie et al. 2005, Asch and Collie 2008, Collie et al. 2009, Smith et al. 2013) have investigated the benthic ecology of and evidence for recovery in the HAPC by comparing habitats inside and outside fishery closures on the northern edge of Georges Bank . The focus of this work is on benthic fauna. A detailed summary of this body of work is provided in Volume 1, section 4.1.2. Overall, while the effects of fishing on the benthic community as measured by species diversity, relative abundance of different taxa, cover of different species of emergent epifauna, etc. are clear, natural disturbance is an important factor in this location, and interannual variation in these factors is often observed.

Although gravel pavement habitats are not rare, they do comprise a relatively small fraction of Georges Bank habitat types, and gravel pavements in this condition do not occur elsewhere on the U.S. side of Georges Bank. There are no known anthropogenic threats to this area beyond those associated with fishing activity.

Cod prey items are also found within the HAPC. Collie et al. (1997) describe the relative abundance of several other species such as shrimps, polychaetes, brittle stars, and mussels in unfished sites within the HAPC. These species are found in association with emergent epifauna such as bryozoans, hydroids, and tube worms that are prevalent in the area. Several studies of the food habits of juvenile cod identify these associated species as important prey items (Hacunda 1981; Lilly and Parsons 1991; Witman and Sebens 1992; Casas and Paz 1994).

The HAPC is expected to improve the fisheries management in the EEZ (see section 4.2) as the designation served to emphasize the importance of these habitats. Beyond juvenile cod, the HAPC encompasses designated EFH for a number of other species, such that conservation of the HAPC may benefit a number of stocks.

Map 244 – Northern Edge cod HAPC, mapped relative to the preferred alternative EFH designations for juvenile Atlantic cod.



3.1.3 Inshore Juvenile Cod HAPC, preferred alternative

In 1999, the Council voted to approve this alternative and include it in the next appropriate fishery management plan amendment. This alternative would define the inshore areas of the Gulf of Maine and Southern New England between 0-20 meters (relative to mean high water) as an HAPC for juvenile cod, as shown on Map 245. Because the HAPC is designated for juvenile cod, it is by definition a subset of juvenile cod EFH. The preferred alternative EFH designation is essentially continuous along the coasts of Maine, New Hampshire, Massachusetts, and Rhode Island, but there are a few gaps in coverage off the Rhode Island and southern Maine coasts. This occurs when a particular location does not meet the 10% of tows in a ten minute square threshold for state survey data, and is not an estuary or embayment where juvenile cod were identified as common or abundant in the ELMR database. Aside from these limited gaps, the juvenile cod EFH designation is nearly continuous along the coasts of Massachusetts, New Hampshire, and Mainefrom the shoreline to depths of 120 meters.

Important ecological function?	Yes
Sensitive to anthropogenic stress?	Yes
Presence of current or future stresses?	Yes
Rarity?	No
Improve fisheries management?	Yes
EFH desingation for more than one species?	Yes
Juvenile cod EFH?	Yes
More than one final rule criteria?	Yes

Rationale: The purpose of this HAPC is to recognize the importance of inshore areas to juvenile Atlantic cod. The coastal areas of the Gulf of Maine and Southern New England contain structurally complex rocky-bottom habitat that supports a wide variety of emergent epifauna and benthic invertebrates. Although this habitat type is not rare in the coastal Gulf of Maine, it provides two key ecological functions for juvenile cod: protection froom predation, and readily available prey.

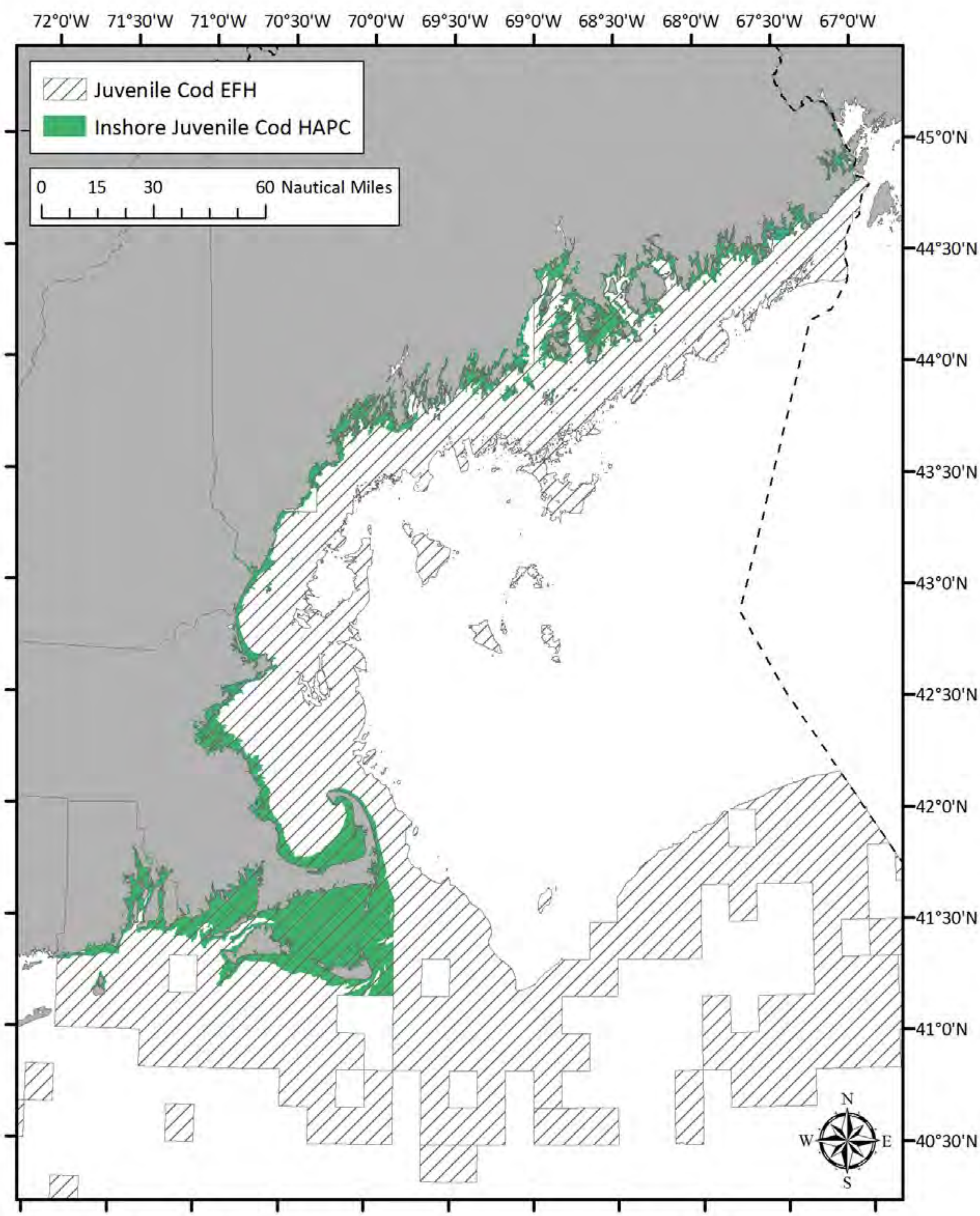
Due to their close proximity to human activities, the inshore and nearshore areas comprising this HAPC are sensitive to anthropogenic stresses. In terms of non-fishing impacts, Table 33 describes eight types of potential chemical threats, 19 categories of potential physical threats and four types of potential biological threats to the four life history stages of Atlantic cod EFH, which are categorized as low, moderate, or high threats (L, M and H, respectively) based on their geographic location (inshore and offshore). Some types and categories of potential chemical, physical and biological threats were unable to be characterized and were assigned “U” (unknown). In general, the closer the proximity to the coast (i.e., close to pollution sources and habitat alterations) the greater the potential for impact. Development-related stresses are ongoing. Structurally complex habitats are also susceptible to fishing gear impacts.

The HAPC is expected to improve the fisheries management in the EEZ, as it highlights the importance of critical inshore habitats which provide habitat for cod from settlement through the first autumn of life, and overlaps seasonal habitat of age-1 juvenile cod. The area also bounds the critical nursery zone for early benthic stages of important juvenile habitat for some other groundfish. The HAPC encompasses EFH designations for numerous Council-managed species,.

Table 33 – Summary of potential inshore impacts of various non-fishing activities to Atlantic cod EFH by lifestage. Key: H = high, M = moderate, L = low, and U = unknown.

Potential Threats	*Type*	*Eggs*	*Larvae*	*Juveniles*	*Adults*
PAH	Chemical	M	M	M	M
PCB		M	M	M	M
Heavy Metals		M	M	M	M
Nutrients		M	M	M	M
Pesticides/Herbicides		U	U	U	U
Acid		M	M	M	L
Chlorine		M	M	M	M
Greenhouse Gases		U	U	U	U
Channel Dredging	Physical	M	M	M	M
Dredge and Fill		M	M	M	M
Dredge Material Disposal		H	M	M	M
Marina/Docks		M	M	M	L
Vessel Operation		M	L	L	L
Utility Lines/Pipelines		U	U	U	U
Oil/Gas Operations		M	M	M	M
Erosion/Flood Control Structures		U	U	U	U
Road Building/Maintenance		U	U	U	U
Dam Construction/Operation		U	U	U	U
Agriculture/Silviculture		U	U	U	U
Water Intake		M	M	L	L
Water Discharge		L	M	M	M
Sewage/Septic Discharge		M	M	M	M
Marine Mining		M	L	L	L
Salinity		L	L	L	L
Suspended Particles		M	M	M	L
Thermal		M	M	M	L
Dissolved Oxygen		M	M	M	M
Exotic Species	Biological	U	U	U	U
Pathogens		U	U	U	U
Aquaculture Operations		U	U	U	U
Plankton Blooms		U	U	U	U

Map 245 – Inshore Juvenile Cod HAPC



3.1.4 Great South Channel Juvenile Cod HAPC, preferred alternative

This alternative defines juvenile cod habitat in the vicinity of the Great South Channel as a habitat area of particular concern for the species (Map 246). The bounding box for the HAPC is the area north of 41°N latitude, west of 69°W longitude, south of 42°15'N latitude, and east of 70°W longitude. Within this box, the HAPC boundary is somewhat irregular, in part because it is based on an earlier considered and rejected version of the EFH designation map that excluded continental shelf habitats shallower than 30 meters. Within the bounding box shown on Map 246, the HAPC combines 'offshore' habitats between 30 and 120 meters with whole, 'inshore' ten minute squares between 69° 50' and 70° W longitude.

The HAPC designation excludes some areas that are part of the preferred alternative EFH designation for juvenile cod. The rationale behind the considered and rejected EFH designation helps to explain the incomplete overlap between juvenile cod EFH and the HAPC within the bounding box. When the Council initially developed the juvenile cod EFH designation, habitats shallower than 30 meters on the continental shelf were excluded because catch rates in the NEFSC trawl survey were relatively low shallower than 30 meters and deeper than 120 meters. However, inshore, in areas sampled by state surveys, many areas shallower than 30 meters were recommended for designation, based on a relatively precautionary threshold where 10% of state survey tows in a ten minute square had to have positive catches of the species in question. Despite the two different approaches used for EFH mapping inshore and offshore, in most areas there was a continuous designation from the shoreline to 120 meters, but there were some notable gaps between inshore and offshore areas, namely on the top of Stellwagen Bank, on Nantucket Shoals, and south of Rhode Island. Shallow habitats on the top of Georges Bank were also excluded. Nantucket Shoals overlaps the bounding box for this HAPC.

The Council's preferred alternative EFH designation for juvenile cod eliminates the minimum depth limit in offshore habitats designated based on the NEFSC trawl survey, and fills in many of these gaps. The rationale for expanding the EFH designation was partially based on an examination of survey catch data in the vicinity of the Great South Channel, where juvenile cod are frequently caught in surveys conducted in state waters by Massachusetts Division of Marine Fisheries. While sampling effort in either state or federal surveys is limited on Nantucket Shoals, the Council agreed it was reasonable to infer that juvenile cod occupy these shallow habitats. Thus, the EFH designation was expanded throughout the species' range to include areas between 0 and 30 meters.

In practice, many areas between 0 and 30 meters were already designated as a result of state survey data, and the area of designated EFH only increased by 1,432 km^2 throughout the species range (2% of the preferred alternative designation, which covers 61,618 km^2). While some patchiness remains in the preferred alternative designation, oweing to scattered ten minute squares that do not meet catch criteria, for the most part, the preferred altenative is continuous from the shoreline to 120 meters along the ME, NH, MA, and RI coasts. On Nantucket Shoals, additional areas are designated EFH as compared to the considered and rejected alternative, but some gaps remain.

Despite this change in mapping methodology, most of the positive NEFSC trawl survey catches within the HAPC bounding box in the Great South Channel are between 30 and 120 meters. Map

247 depicts the number of juvenile cod caught during survey tows conducted since the year 2000, and compares the NEFSC trawl survey (red) with tows conducted during other surveys, including the MADMF survey (green). Therefore, although quite possibly the result of limited sampling effort, there is stronger evidence to support the importance of the waters between 30 and 120 meters as a habitat area of particular concern. In addition, fishing activities for groundfish and sea scallops are more concentrated in the deeper areas of the HAPC.

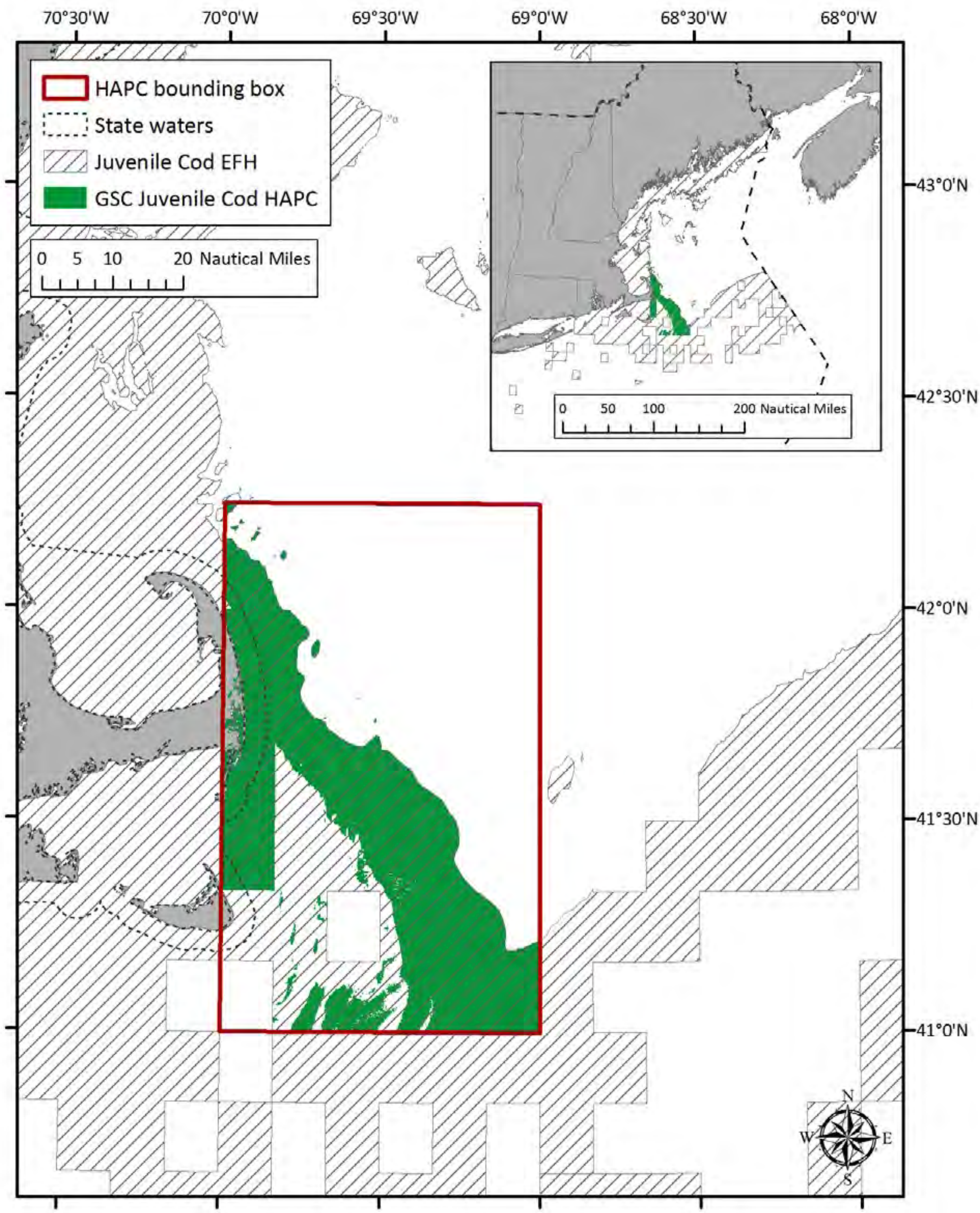
Rationale: The purpose of this HAPC is to recognize the importance of the area for its high benthic productivity and hard bottom habitats, which provide structured benthic habitat and food resources for cod and other demersal managed species.

Rationale for Great South Channel Juvenile Cod HAPC	
Important ecological function?	Yes
Sensitive to anthropogenic stress?	Yes
Presence of current or future stresses?	Yes
Rarity?	No
Improve fisheries management?	Yes
EFH desingation for more than one species?	Yes
Juvenile cod EFH?	Yes
More than one final rule criteria?	Yes

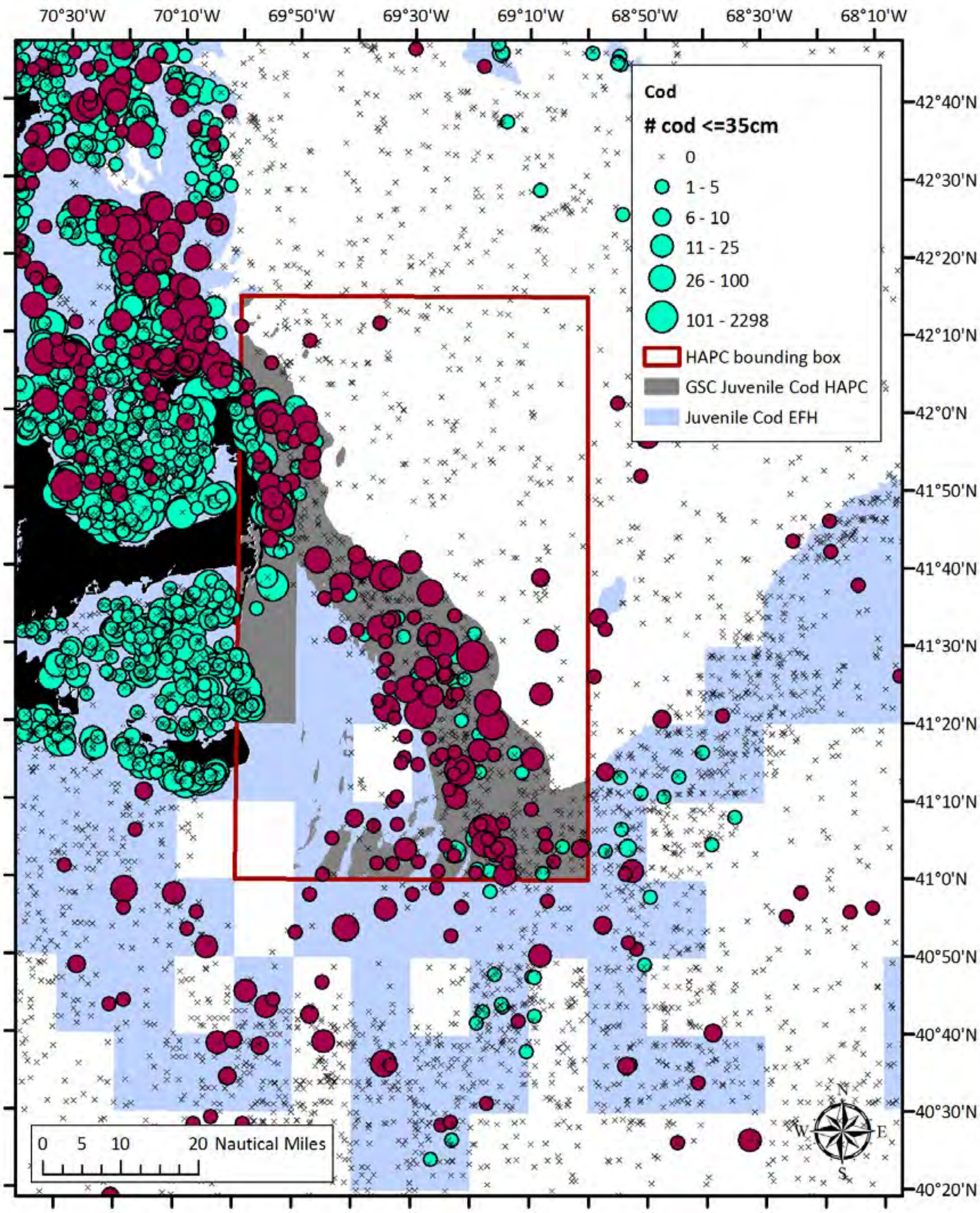
The HAPC is ecologically important. This area contains structurally complex gravel, cobble, and boulder habitat, which supports a wide array of emergent epifauna that juvenile cod rely on for food and shelter from predation. Within the area, many different types of habitats exist that are important to juvenile cod. The area is sensitive to anthropogenic stresses, contains habitat features that are particularly sensitive to the adverse effects associated with bottom trawling, scallop dredging, and clam dredging. Most of the area is offshore, but nearshore portions are susceptible to current or future coastal development stresses. Complex, structured habitats found in the HAPC are not rare considering the entirety of Georges Bank, but they do comprise a relatively small fraction of Georges Bank habitat types.

The HAPC could improve the fisheries management in the EEZ to the extent that it fosters increased conservation of offshore habitats for juvenile cod. The area encompasses designated EFH for many Council-managed species, including, of course, juvenile cod.

Map 246 – Great South Channel Juvenile Cod HAPC



Map 247 – Juvenile cod (# per tow) caught in fishery-independent surveys conducted since 2000. The red circles indicate spring and fall NEFSC trawl survey stations, and the green circles indicate all other surveys, including state surveys, industry based surveys, and the scallop survey. The NEFSC spring and fall trawl surveys were the foundation for the offshore portion of the EFH designation, which was initially limited to waters deeper than 30 meters. The preferred alternative EFH designation is shown in blue, and the subset which is the recommended Great South Channel HAPC is shaded grey. Tows where there was no catch of cod are indicated with a small X.



3.1.5 Cashes Ledge HAPC, preferred alternative

This alternative would define the current Cashes Ledge Habitat Closure Area as a Habitat Area of Particular Concern (Map 248). Note that the preferred alternative habitat management area on Cashes Ledge is somewhat smaller, with its western boundary shifted east to eliminate the deeper portions of the closure.

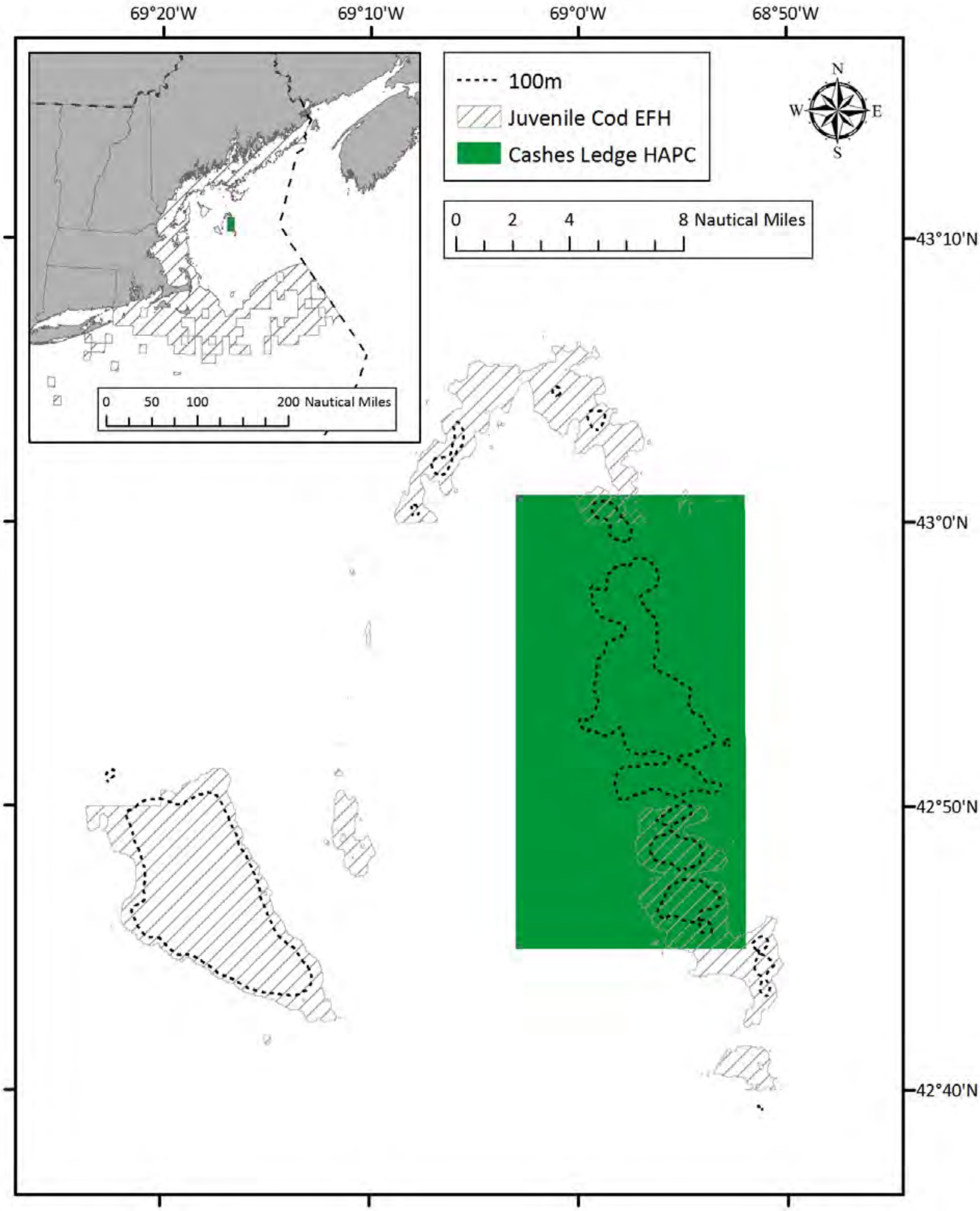
Point	N Latitude	W Longitude
CLH1	43° 01’	69° 03’
CLH2	43° 01’	68° 52’
CLH3	42° 45’	68° 52’
CLH4	42° 45’	69° 03’

Important ecological function?	Yes
Sensitive to anthropogenic stress?	Yes
Presence of current or future stresses?	Yes
Rarity?	Yes
Improve fisheries management?	Yes
EFH desingation for more than one species?	Yes
Juvenile cod EFH?	Yes
More than one final rule criteria?	Yes

Rationale: The purpose of this HAPC is to highlight the unique characteristics of Cashes Ledge and to recognize the importance of the area as habitat for a variety of managed species. Cashes Ledge is comprised of a series of rocky pinnacles that jut up from the deep basins in the middle of the Gulf of Maine. The area is highly productive as a result of internal waves that drive thick, plankton-rich layers down to the ledge (Witman et al. 1993). A striking feature of the ledge is Ammen Rock pinnacle, a relatively shallow habitat where kelp occurs in high abundance, which is unusual offshore. In particular, the combination of sunlight and nutrient-rich waters fuels the growth of one of the largest kelp forests and deepest seaweed communities in the world.

Upwelling and internal waves deliver fish and invertebrate larvae to the shallow pinnacles, where settlement occurs. Dense aggregations of habitat forming invertebrates such as horse mussels, sea anemones, and sponges thrive on Cashes Ledge (Witman and Sebens 1988, Lesser et al. 1994, Genovese and Witman, 1999, Hill et al. 2002), while burrowing anemones are abundant in the sand-gravel matrix nearby (Witman and Sebens 1988). In terms of fishes, Cashes Ledge supports a high abundance of large-bodied predators such as cod, wolffish, pollock, and sharks (Steneck 1997, Steneck and Carlton 2001, Witman and Sebens 1992). Fish may aggregate or have higher survival after settlement in the Cashes Ledge area due to increased availability of shelter (e.g., kelp forests, structure forming invertebrates) and abundant prey (Witman et al. 1993, Leichter and Witman 1997, Genovese and Witman 1999). Other species are found on and around the ledge, and the HAPC encompasses numerous EFH designations, including for juvenile cod. This combination of features makes Cashes Ledge a rare habitat type within the new England region. These benthic habitat features are sensitive to anthropogenic stresses, including impacts caused by fishing gear. This area is currently closed to many types of fishing, as it is both a groundfish closure and a habitat closure, but this status could change as a result of future fishery management actions. Other types of development stresses do not pose a significant threat.

Map 248 – Cashes Ledge HAPC. Juvenile cod EFH is shown because it is a Council criterion. The 100m contour visually defines the ledge feature.



3.1.6 Jeffreys Ledge/Stellwagen Bank HAPC, preferred alternative

This alternative would designate the existing Western Gulf of Maine Habitat Closure Area as the Jeffreys Ledge/Stellwagen Bank HAPC (Map 249). This alternative was selected as preferred from three different proposals (the others are described in section 0).

Important ecological function?	Yes
Sensitive to anthropogenic stress?	Yes
Presence of current or future stresses?	Yes
Rarity?	No
Improve fisheries management?	Yes
EFH desingation for more than one species?	Yes
Juvenile cod EFH?	Yes
More than one final rule criteria?	Yes

Rationale: The purpose of this HAPC is to recognize the importance of the area as habitat for a variety of managed species.

The important ecological functions of the area have been recognized for over a century. Captain Henry Stellwagen first described the Stellwagen Bank area in 1854 as a fifteen fathom bank characterized by a rocky substrate on the northern flank, sand features in the middle and southern end, and deeper mud basins just inshore of the bank itself. After the turn of the century, the report entitled "Fishing Grounds of the Gulf of Maine" identified both Jeffreys Ledge and Stellwagen Bank (or Middle Bank) as key fishing grounds. Jeffreys was known to contain rocky bottom in the shoaler water with gravel and pebbles along the edges. It was considered one of the best fishing grounds in the Gulf of Maine with cod, haddock, pollock, cusk, hake, flounder, herring, and mackerel all found in the area. Stellwagen and Tillies Banks (Tillies is west of the HAPC) were also identified as important fishing grounds with cod, haddock, pollock, cusk, and hake all present during times of the year (Rich, 1929). Additionally, the area has been recognized as a preferred habitat for several marine mammal species and seabirds for decades.

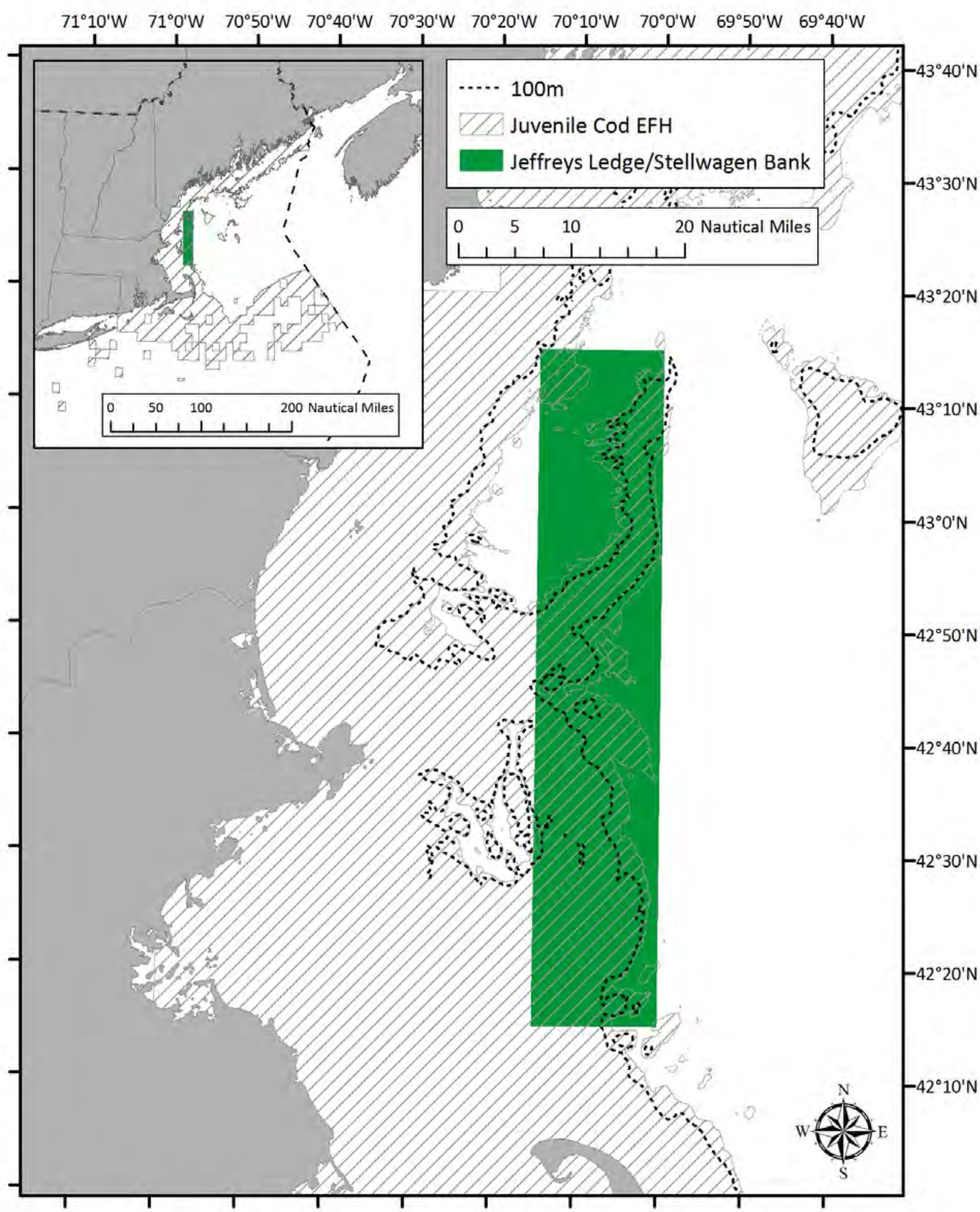
Jeffreys Ledge and Stellwagen Bank are shallow, glacially formed features that include a diversity of habitat types, including gravel/cobble substrates, boulder reefs, sand plains, and deep mud basins in a complex matrix. Oceanographic currents driven by the Gulf of Maine Coastal Current as well as from the impingement of internal waves deliver nutrient-rich waters to the area and the topographic features of the area result in upwelling that drives production. The complex matrix of sedimentary habitats supports a wide diversity of structure forming invertebrates including frilled anemones, burrowing anemones, sponges, bryozoans, ascidians, and cold water corals (Auster et al. 1998, Grannis 2001). Such habitats are important areas for recruitment and survival of species such as cod, haddock, cusk, Acadian redfish, silver hake, and a diversity of flounders (e.g., Auster et al. 2001, 2003a and 2003b). Further, the Jeffreys Ledge-Stellwagen Bank area supports a high diversity of fishes compared to many other areas in the Gulf of Maine (Auster 2002).

Development activities are currently and will continue to put stress on habitats within the HAPC. Non-fishing threats include 1) vessel discharges (ballast and gray water) from cruise ships and cargo vessels, 2) future sand and gravel mining operations, 3) fiber-optic cable and pipeline construction, and 4) potential new industrial uses of the coastal waters and seabed including offshore aquaculture facilities, wind energy facilities, and other energy-related infrastructure. Habitats in the HAPC are also vulnerable to the adverse effects of fishing, particularly from mobile, bottom-tending gear types. This area is currently closed to many types of fishing, as it is both a groundfish closure and a habitat closure, but this status could change as a result of future fishery management actions.

While habitat types in the HAPC are not particularly rare with respect to the Gulf of Maine, the area is important in that is includes a wide diversity of habitat types in the Gulf of Maine in a single discrete location. In particular, the habitats contained within the area include an extreme depth range, which bathes these features in Maine Surface and Intermediate Waters.

The HAPC is expected to improve the fisheries management in the EEZ, through recognition of habitats that are important areas for recruitment and survival of species such as cod, haddock, Acadian redfish, silver hake, and a diversity of flounders. The HAPC supports a high diversity of fishes compared to many other areas in the Gulf of Maine and the designation should continue to highlight its importance in terms of fishery management and conservation. The area includes EFH designations for many Council-managed species, including juvenile cod.

Map 249 – Jeffreys Ledge and Stellwagen Bank HAPC. Juvenile cod EFH is shown because it is a Council criterion. The 100m contour visually defines Jeffreys Ledge and the eastern edge of Stellwagen Bank.



3.1.7 Bear and Retriever Seamounts HAPC, preferred alternative

This proposed alternative would designate as an HAPC the tops of Bear and Retriever seamounts that overlap spatially with the proposed EFH designation for deep-sea red crab. Red crab EFH was designated to a depth of 2000 meters (the seamounts meet the abyssal plain at depths of 3000-4000 m). Both parts of the HAPC include just the shallowest parts of the seamounts (to 2000 m), which is the maximum depth of designated EFH on the seamounts. The other seamounts within the EEZ, Physalia (east of Bear) and Mytilus (southeast of Bear) are deeper than 2000 m at their shallowest points. The Bear Seamount HAPC is located between 67°30' W longitude and 67°20' W longitude and 39°50' N latitude and 40°00' N latitude. The smaller Retriever Seamount HAPC is located between 66°16' W longitude and 66°13' W longitude and 39°48' N latitude and 39°51' N latitude. More precise coordinates are not available given the depth-based boundary.

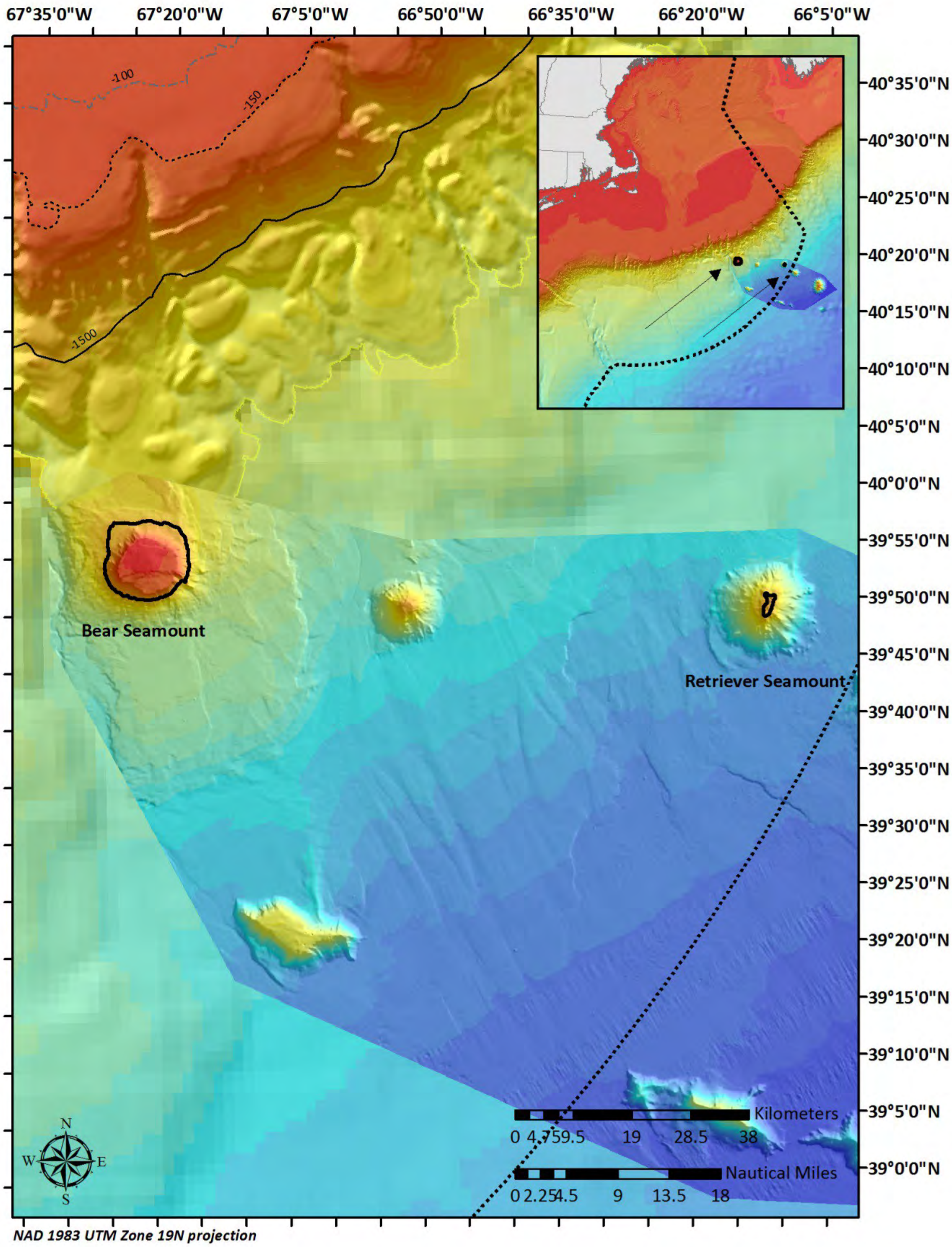
Important ecological function?	Yes
Sensitive to anthropogenic stress?	Yes
Presence of current or future stresses?	No
Rarity?	Yes
Improve fisheries management?	Yes
EFH desingation for more than one species?	No
Juvenile cod EFH?	No
More than one final rule criteria?	Yes

Rationale: The New England Seamount Chain, the Corner Rise Seamounts, the mid-Atlantic Ridge, and the deep sides of the Azores constitute a nearly continuous series of hard substrate "islands" in a sea of abyssal mud extending across the North Atlantic Ocean. The New England Seamount chain is a line of extinct volcanoes running from the southern side of Georges Bank to a point midway across the western Atlantic. The most westerly seamounts (i.e., Bear, Physalia, Retriever, and Mytilus) are within the boundary of the United States Exclusive Economic Zone, and the shallower of these, Bear and Retriever, coincide with designated red crab EFH.

Seamounts are rare habitats in the context of the North Atlantic basin.These habitats are are geographically isolated from continental platforms, with locally steep and complex topography and broad depth ranges (approximately 2000 meters) from the peak of the seamount to the abyssal plain. Although there is no clear evidence for seamount-scale endemism in the northwest Atlantic (Thoma et al. 2009), these areas are nonetheless important ecologically as they may provide "stepping stones" for dispersal and maintenance of populations of deepwater demersal fishes across ocean basins where their vertical distributions are restricted to slope depths. Seamounts are dominated by hard substrates and invertebrate suspension feeders. These include the deep-sea corals, which are extremely sensitive to anthropogenic stresses and likely have recovery periods on the order of centuries.

There are no current or known future development stresses on the New England seamounts. These areas are not currently fished, and no other development is currently occurring and it is unknown whether any will take place in the future. Nonetheless, this HAPC would improve fisheries management in the EEZ to the extent that it drives research and precautionary conservation efforts related to these rare habitats.

Map 250 – Bear and Retriever Seamounts HAPC (heavy black outlines, to 2000 meters).



3.1.8 Canyon HAPCs

These alternatives would designate HAPCs in canyons or groupings of canyons south of Georges Bank and offshore of the Mid-Atlantic Bight. Note that although the HAPC criteria are discussed below for all of the canyon HAPCs combined, each of the canyon HAPCs is considered an individual designation. While there are numerous other smaller canyons throughout the region, the proposed HAPCs are generally restricted to the larger and better known areas.

Important ecological function?	Yes
Sensitive to anthropogenic stress?	Yes
Presence of current or future stresses?	Yes
Rarity?	No
Improve fisheries management?	Yes
EFH desingation for more than one species?	Yes
Juvenile cod EFH?	Very slight overlap in shallow portion of Lydonia/Oceanographer HAPC
More than one final rule criteria?	Yes

Rationale: The continental slope off the Northeastern U.S. shelf is cut by more than 20 large canyons between Georges Bank and Cape Hatteras, and numerous smaller canyons and gullies, many of which may feed into the larger canyon systems. The main purpose of the individual canyon HAPC alternatives is to identify canyons in the northeastern U.S. that contain or are believed to contain habitat-forming organisms including, but not limited to, stony corals (Scleractinia), black corals (Antipatharia), cerianthid anemones (Ceriantheria), soft corals and gorgonians (Alcyonacea), sea pens (Pennatulacea) and sponges. Recognizing the importance of these species and their communities will be a first step towards maintaining the vital functions they provide for managed fish species, of which there is some evidence but also a clear need for further research.

The canyon and slope areas identified as HAPCs are geologically diverse, which contributes to the varied species composition in different areas. This effect of substrate diversity may be aided by an abundance of nutrients introduced by the relatively strong currents in the canyons (Hecker, Blechschmidt, and Gibson, 1980). On average, the continental slope has a gradient of 3-6°; however, local gradients can be nearly vertical. The base of the slope, where the continental rise begins, is defined by a marked decrease in seafloor gradient. Occasional boulders occur on the slope as a result of glacial rafting, and coarse sediments and rock outcrops are found locally on and near canyon walls. Sand deposits may also be formed as a result of downslope movements. A “mud line” occurs on the slope at a depth of 250-300 meters, below which fine silt and clay size particles predominate over sand.

With respect to fisheries management and habitat protection, at many invertebrate species found in the canyons, including those referenced above, create structural habitats for other marine organisms. The Georges Bank canyons apparently serve as nurseries for a number of bottom animals, including such commercially valuable species as lobster, Jonah crab, red crab, tilefish, and several kinds of hake. The young of such animals have been observed both in naturally occurring and in excavated shelters in the bottom, in both the semi-consolidated sandy silts (which look like clay) and in boulder fields. Such substrates are common in the canyons (Cooper and Uzmann, 1980 a,b). Concentrations of lobsters (juvenile and adult), for example, are substantially greater in submarine canyons than in areas nearby (Cooper and Uzmann, 1980a); lobsters seen inside the canyons are usually juveniles, while those nearby but outside the canyons are usually adults.

In general, assemblages of animals in the heads of various Georges Bank canyons are similar. Within these assemblages, groups that favor shallow and middle depths can be distinguished. The distinction is most clearly seen in the relative abundance of red crabs, portunid crabs, lobsters, witch flounder, ocean pout, conger eels, tilefish, squirrel hake, common grenadier, slime eels, long-nosed eels, and black-bellied rosefish. An outer shelf/upper slope faunal zone (113-299 meters) and a mid-slope zone (300-1099 meters) were found by Haedrich, Rowe, and Polloni (1975) in Alvin Canyon and by Valentine, Uzmann, and Cooper (1980) in Oceanographer Canyon. Hecker et al. (1990) conducted zonal analysis for four slope (non-canyon) locations between 66° W and 72° W, and identified similar upper and upper middle slope depth ranges. Further evidence for this zonation in Oceanographer and Lydonia Canyon has come from Hecker (pers. comm.). Faunal diversity and, to some extent faunal abundance, in the canyon heads appear to be closely tied to the presence of cobbles and boulders on the ocean floor and to exposures of the consolidated sandy silt into which various animals tunnel and burrow. Recent (2013-2015) surveys of the canyon and seamount environments have yielded substantial amounts of new information about the diversity of geological and biological environments found in the canyons and in adjacent slope areas, as well as on the seamounts. Analysis of these data will enhance our understanding of the complex ecological relationships in these deep-waters environments.

The canyons and their faunal inhabitants are sensitive to anthropogenic disturbance, although in practice the steep slopes of the canyon walls are generally inaccessible to mobile fishing gear, such as dredges and otter trawls. Except for trap fisheries for red crab and lobster, deeper canyon inhabitants are not generally targets of a fishery. Thus, the canyons serve as refuges for bottom species that are sought commercially elsewhere. However, the shallower and less steep parts of the canyons are accessible to fishing for species such as monkfish, squid, offshore hake, and others. The potential for future non-fishing development of shallower parts of these canyons exists, but does not appear to constitute an immediate threat.

The canyons may be regarded as highly modified areas of the continental slope that exhibit to varying degrees a more diverse fauna, topography, and hydrography than the intervening slope areas. Alternating erosional and depositional episodes over geologic time have shaped and modified these canyon systems into specialized habitats distinct from the classically defined slope province. While the canyons are numerous, and therefore are not considered rare, each one has unique individual characteristics in terms of geologic and species diversity, and may contain rare organisms.

The canyon HAPCs may improve the fisheries management in the EEZ through reduction in the development of these areas for fishing or non-fishing purposes. This will protect the structure and function of these habitats and maintain their ability to support managed species productivity.

Numerous managed species found in deeper slope waters have designated EFH within the HAPCs, particularly along the landward edge. Some of the canyons extend beyond the depth of designated EFH (i.e. 1500 meters) but the HAPCs are limited to a maximum depth of 1500 meters, which corresponds with the maximum EFH designation depth in the canyons and on the continental slope. Coordinates are provided below for the corners of the HAPCs.

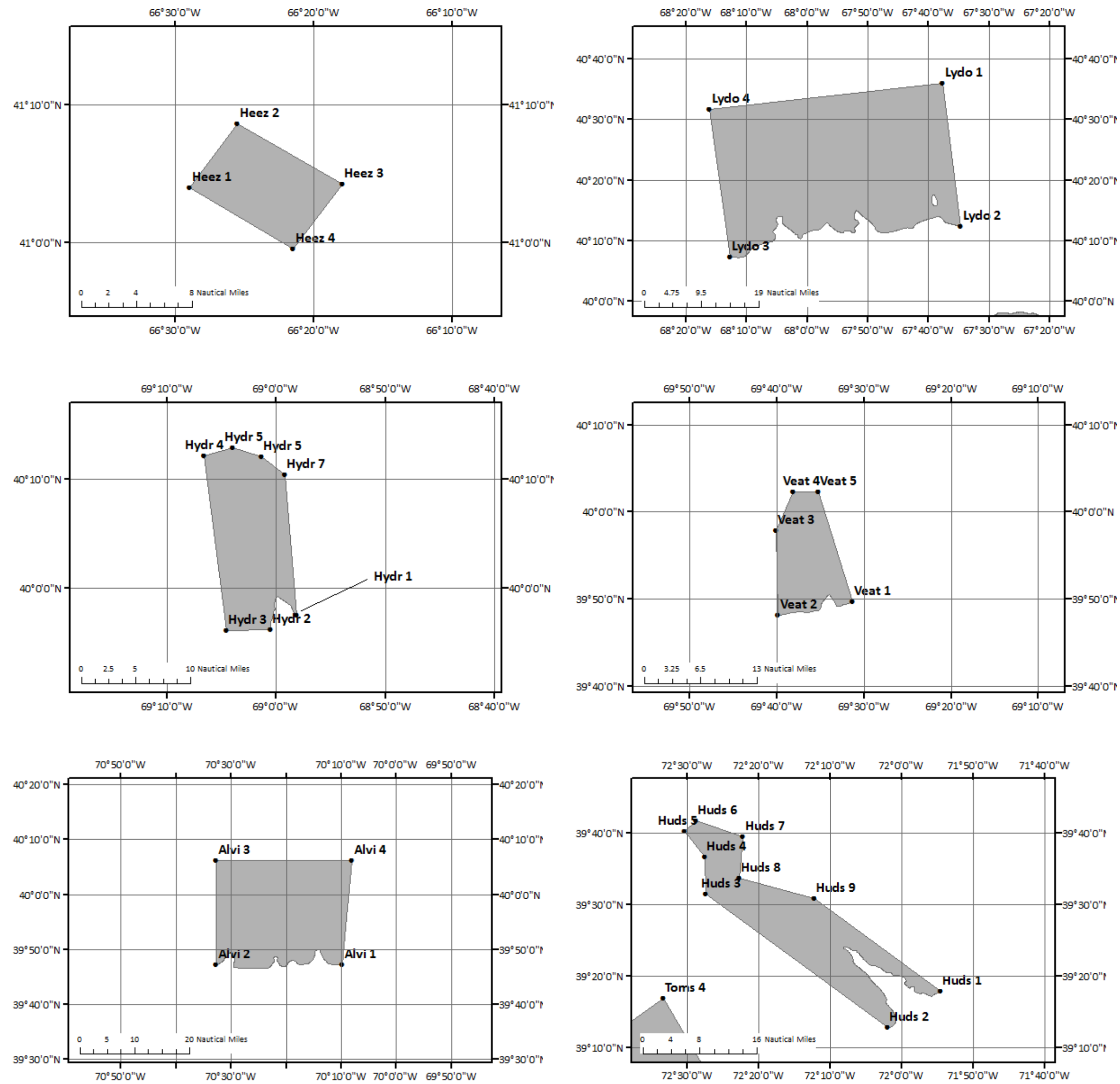
Table 34 – Coordinates for canyon HAPCs in decimal degrees, listed from northeast to southwest. The points listed below correspond with the figures on the pages that follow.

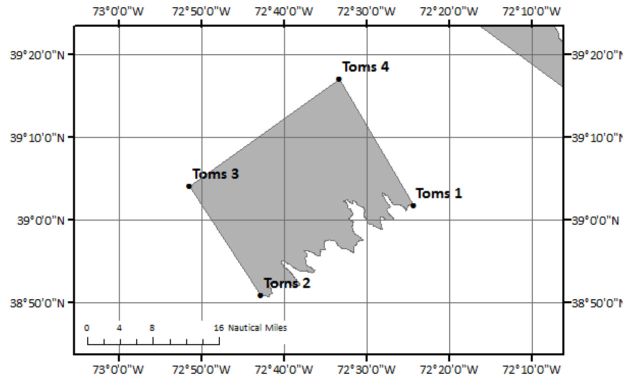
Name	*Point*	*Longitude*	*Latitude*
Heezen Canyon HAPC	Heez 1	-66.482	41.066
	Heez 2	-66.425	41.143
	Heez 3	-66.298	41.070
	Heez 4	-66.358	40.993
Lydonia, Gilbert & Oceanographer Canyons HAPC	Lydo 1	-67.628	40.600
	Lydo 2	-67.578	40.207
	Lydo 3	-68.212	40.122
	Lydo 4	-68.268	40.527
Hydrographer Canyon HAPC	Hydr 1	-68.968	39.960
	Hydr 2	-69.009	39.937
	Hydr 3	-69.075	39.936
	Hydr 4	-69.110	40.201
	Hydr 5	-69.065	40.215
	Hydr 5	-69.022	40.200
	Hydr 7	-68.986	40.173
Veatch Canyon HAPC	Veat 1	-69.522	39.829
	Veat 2	-69.665	39.802
	Veat 3	-69.669	39.964
	Veat 4	-69.636	40.038
	Veat 5	-69.588	40.039
Alvin & Atlantis Canyons HAPC	Alvi 1	-70.164	39.788
	Alvi 2	-70.546	39.786
	Alvi 3	-70.544	40.103
	Alvi 4	-70.133	40.103
Hudson Canyon HAPC	Huds 1	-71.909	39.300
	Huds 2	-72.032	39.214
	Huds 3	-72.456	39.525
	Huds 4	-72.457	39.611
	Huds 5	-72.505	39.671

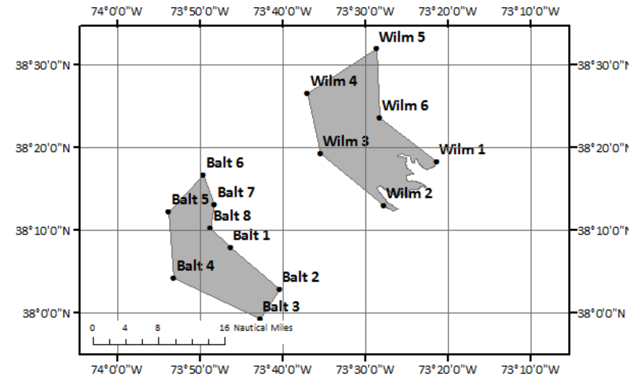
Name	Point	Longitude	Latitude
	Huds 6	-72.478	39.695
	Huds 7	-72.368	39.658
	Huds 8	-72.378	39.561
	Huds 9	-72.203	39.514
Toms, Middle Toms & Hendrickson Canyons HAPC	Toms 1	-72.405	39.029
	Toms 2	-72.712	38.848
	Toms 3	-72.856	39.067
	Toms 4	-72.555	39.283
Wilmington Canyon HAPC	Wilm 1	-73.356	38.304
	Wilm 2	-73.463	38.216
	Wilm 3	-73.590	38.320
	Wilm 4	-73.616	38.442
	Wilm 5	-73.477	38.533
	Wilm 6	-73.472	38.394
Baltimore Canyon HAPC	Balt 1	-73.772	38.131
	Balt 2	-73.673	38.047
	Balt 3	-73.712	37.988
	Balt 4	-73.886	38.070
	Balt 5	-73.896	38.204
	Balt 6	-73.826	38.278
	Balt 7	-73.804	38.218
	Balt 8	-73.812	38.172
Washington Canyon HAPC	Wash 1	-74.504	37.509
	Wash 2	-74.435	37.455
	Wash 3	-74.305	37.397
	Wash 4	-74.406	37.335
	Wash 5	-74.507	37.403
	Wash 6	-74.523	37.479
Norfolk Canyon HAPC	Norf 1	-74.672	37.120
	Norf 2	-74.622	37.086
	Norf 3	-74.576	37.077
	Norf 4	-74.488	37.062
	Norf 5	-74.556	36.978
	Norf 6	-74.665	37.013
	Norf 7	-74.689	37.060

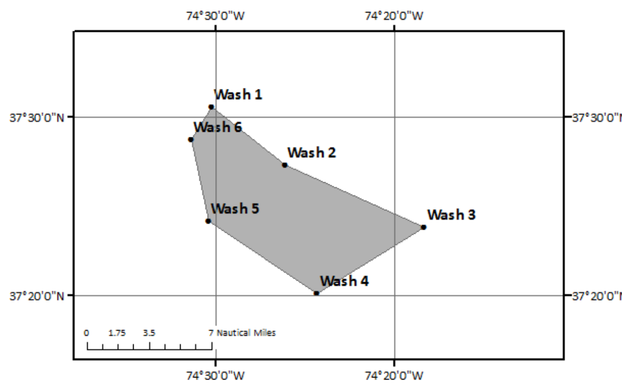
Name	***Point***	***Longitude***	***Latitude***
	Norf 8	-74.728	37.055
	Norf 9	-74.775	37.082
	Norf 10	-74.763	37.117

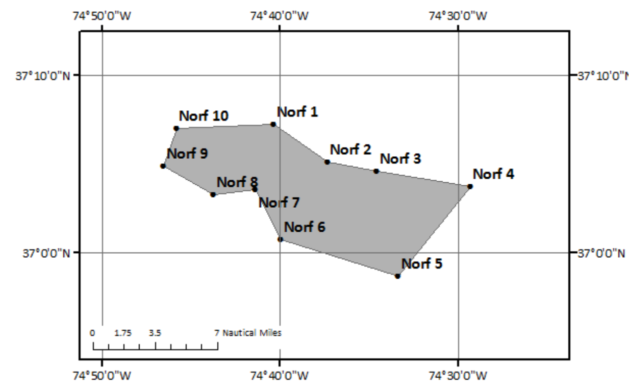
Figure 1 – Coordinates for canyon HAPCs. Irregular boundaries between two points follow the 1500 meter contour.











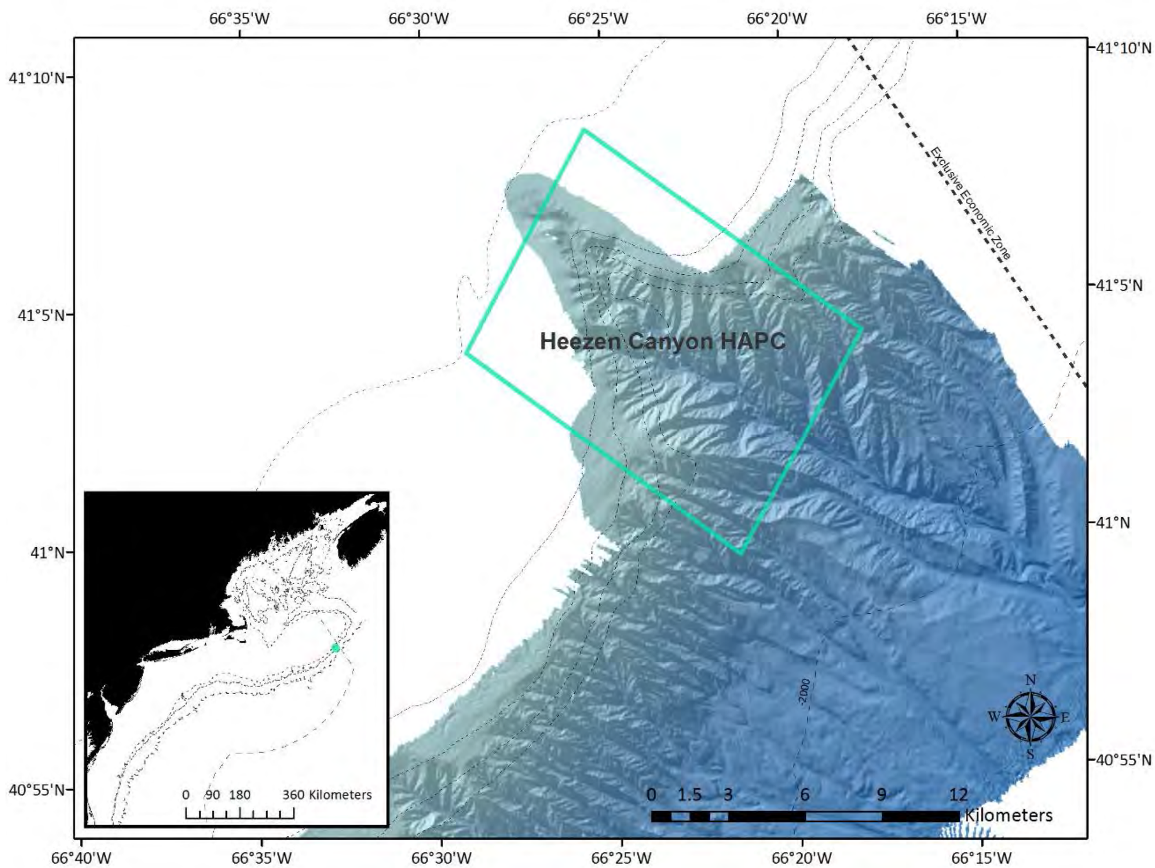
3.1.8.1 Heezen Canyon HAPC, preferred alternative

The Heezen Canyon HAPC is characterized below with respect to geomorphology and presence of deep-sea corals. Boundaries are mapped on the following page with depth shading and contours for reference.

A bathymetric survey of Heezen Canyon was done in 1977 by Ryan et al. The results of the survey were described in Ryan et al. 1978 and also discussed in Hecker and Blechschmidt (1979). Heezen is a very narrow and deeply incised canyon, described as "an extremely narrow and winding gorge cut into sheer cliffs of massive chalk." Substrate was characterized during Alvin submersible dives; two up the axis or thalweg of the canyon, and a third up the southwest wall at depths of 850 to 1630 m. The canyon floor is muddy to sandy ripple-marked with minor consolidated clay outcrops; the axis is heavily littered with large talus blocks and flanked by massive outcrops with numerous sediment dusted ledges. Exposures of limestone and calcareous sandstone were described as cliff-like, including a 70 m high cliff of white chalk in the canyon axis. The walls were described as steep, mud-covered slope, with complex terrain of mud ridges and steep gullies and some exposed bedrock outcrops and occasional glacial erratics.

Corals were documented by Hecker and Blechschmidt (1979), Hecker et al. (1980), and Opresko (1980). Species included stony corals *Desmophyllum dianthus*, *Flabellum alabastrum*; soft corals *Anthomastus agassizii*, *Anthomastus grandiflorus*, *Clavularia rudis*, *Duva* (= *Capnella*) *florida*, *Gersemia fruticosa*, *Acanella arbuscula*, *Paramuricea grandis*; sea pens *Anthoptilum grandiflorum*, *Halipteris* (=*Balticina*) *finmarchica*, *Kophobelemnon stelliferum*.

Map 251 – Heezen Canyon HAPC



3.1.8.2 Lydonia/Gilbert/Oceanographers Canyon HAPC, preferred alternative

Lydonia, Gilbert, and Oceanographer Canyons are combined into a single HAPC. The HAPC is characterized below with respect to geomorphology and presence of deep-sea corals in each canyon. Lydonia is the easternmost of the three canyons and Gilbert is in the middle. While the canyons extend into deeper water, the HAPC is limited to the maximum depth of designated EFH, 1500 meters. Both Lydonia and Oceanographer are well-characterized scientifically, and have other management areas overlapping their boundaries, including EFH Closures to fishing while on a monkfish day at sea, and gear restricted areas and HAPCs for tilefish (see map). Boundaries are mapped on the following page with depth shading and contours for reference.

A bathymetric survey of Lydonia canyon was conducted in 1979. The canyon morphology was described by Hecker et al. (1980), Thompson et al. (1980), Hecker et al. (1983), and Pratt (1967). Lydonia is a relatively large canyon with a narrow axis (seldom >50 m wide) and steep walls incised by numerous small tributaries. It joins the deep-sea channel for Gilbert Canyon on the continental rise. An updated bathymetric map of Lydonia Canyon was produced during a NOAA ship Okeanos Explorer cruise during May and June 2012.

The 1980s studies noted above also investigated substrate distributions. Hecker et al. (1980) found that fine sediment predominates on the walls and along the axis, with rock outcrops mainly restricted to axis with occasional exposures on walls. Glacial erratics – mostly cobbles and pebbles with some shell hash – are abundant on the east flank above 400 m and present in reduced numbers on west flank. They noted that Lydonia Canyon appears to be an area of active erosion, especially along the canyon axis. Hecker and Blechschmidt 1979 found that the head of Lydonia canyon (150-400 m) is predominantly sandy interspersed with gravel, cobbles, and glacial erratics. Thompson et al. (1980) described the lower and mid canyon walls as comprised of outcropping and subcropping strata, with less exposed outcrop towards head of canyon, and narrow sandy and rippled floor, and broad area of cobbles and boulders on lower east flank and a small patch on west flank; surface sediment sandy on walls and along axis. Hecker et al. (1983) noted that both canyon walls exhibit massive exposures of outcrop, as well as steep talus slopes, along most of their length, and that in middle of canyon, where it incises the shelf, well developed ridges and tributaries dominate the upper walls, and glacial erratics are found throughout the canyon.

Numerous corals have been identified in Lydonia Canyon during various studies, including Hecker and Blechschmidt 1980 and Hecker et al. 1983. Species include stony corals *Dasmosmilia lymani*, *Desmophyllum dianthus*, *Solenosmilia variabilis*, *Javania cailleti*; soft corals *Anthomastus agassizii*, *Clavularia rudis*, *Duva* (= *Capnella*) *florida*, *Capnella glomerata*, *Paragorgia arborea*, *Primnoa resedaeformis*, *Acanthogorgia armata*, *Anthothela grandiflora*, *Acanella arbuscula*, *Paramuricea grandis*; and the sea pens *Anthoptilum murrayi*, *Kophobelemnon stelliferum*, *Pennatula aculeata*, *Pennatula grandis*, *Distichoptilum gracile*, *Stylatula elegans*. Smithsonian records also list *Lophelia pertusa* (stony), *Keratoisis* sp. (soft), *Scleroptilum grandiflorum* (sea pen).

Gilbert Canyon is somewhat less well studied, but seems to form a canyon system with Lydonia and Oceanographer. Pratt (1967) and Valentine (1987) describe the canyon's morphology. Gilbert canyon incises the shelf about 9.5 km, and joins with Lydonia to form a well-defined channel extending seaward at least 100 km across the continental rise. Gilbert Canyon has the same width and is a little deeper at its mouth than Veatch Canyon to the west, and is deeper and wider than Oceanographer Canyon, but is not as deep as Lydonia Canyon. An updated bathmetric map of Gilbert Canyon was produced during a NOAA ship Okeanos Explorer cruise during May and June 2012.

Thoma et al. (2009) and Cooper et al. (1987) provide limited information about coral distributions in Gilbert Canyon. More recently, results of updated bathymetric mapping combined with the results of coral habitat suitability modeling study led to a July 2012 groundtruthing cruise to investigate local distributions of corals in Gilbert Canyon, Veatch Canyon, and the Toms Canyon complex. High diversity and abundance of corals were found during the cruise, including black corals, which had previously been found on the seamounts but not within the canyons incising the continental shelf.

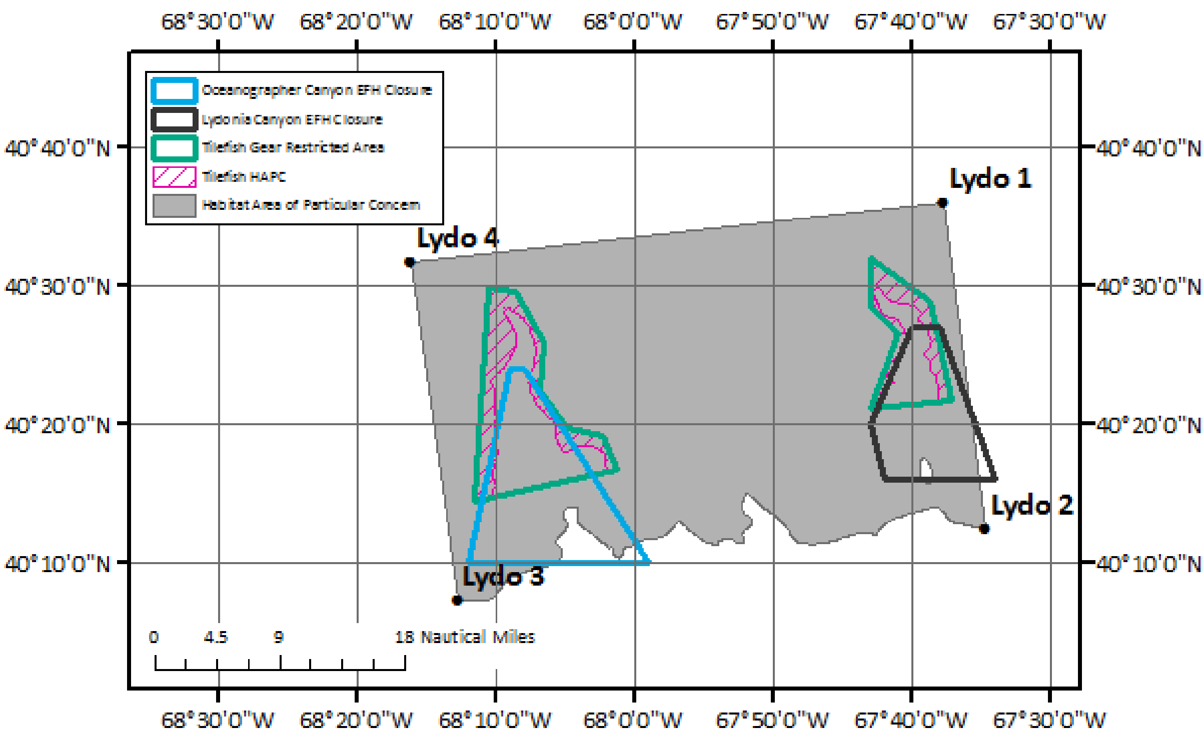
The morphology of Oceanographer Canyon was evaluated by Ryan et al. (1978), Hecker et al. (1980), Thompson et al. (1980), and Pratt (1967). Oceanographer is a deeply incised canyon with steep walls and numerous lateral tributaries, mostly originating below the shelf edge at depths

>200 m. There is a large secondary channel east of the axis in the lower part of the canyon. An updated bathmetric map of Oceanographer Canyon was produced during a NOAA ship Okeanos Explorer cruise during May and June 2012.

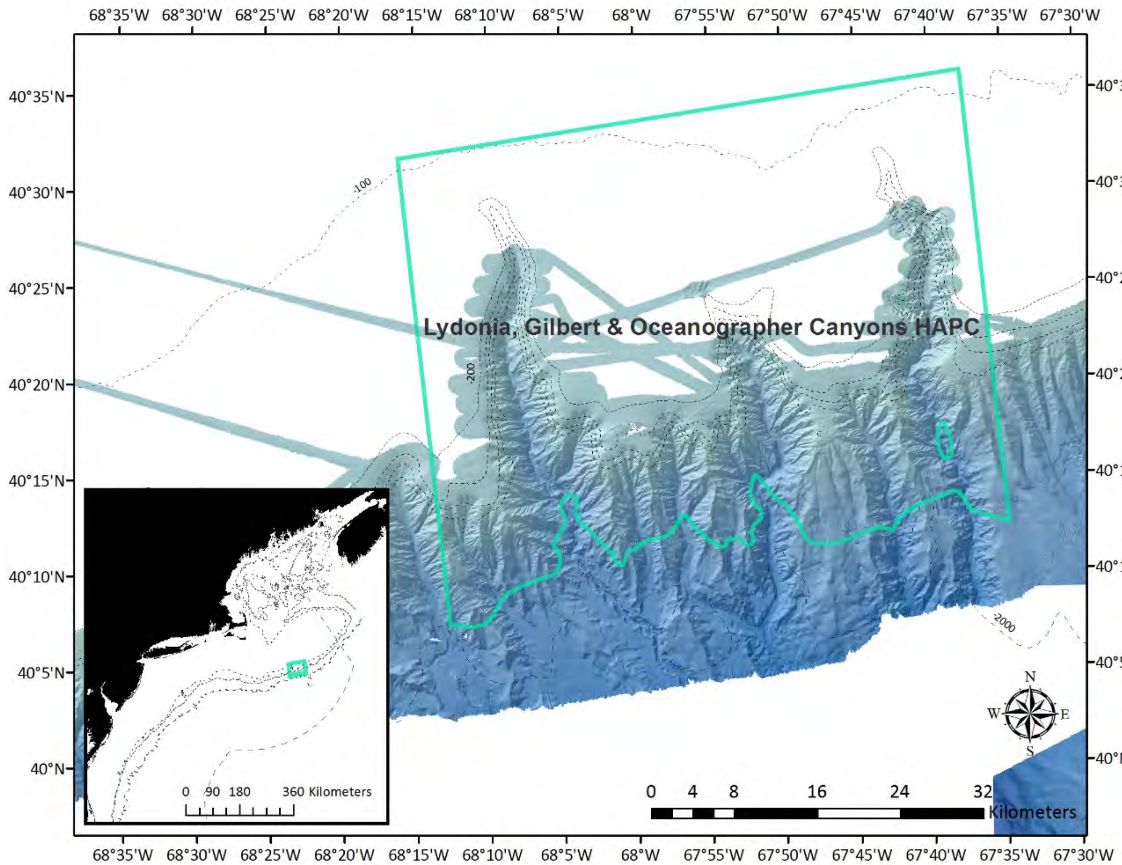
Many sources including those listed above have investigated the sedimentary composition of Oceanographer Canyon. These include Hecker and Blechschmidt (1979), Valentine et al. (1980), six ALVIN submersible dives in 1978, 8 NEKTON-GAMMA dives in 1974, 4 camera sled transects in 1979, and dredge samples collected in 1979. Overall, a diversity of sediment types have been noted in various locations throughout the canyon, with muds and sands, gravels, and rock outcrops present.

Various sources have documented coral diversity in Oceanographer Canyon, including Hecker et al. (1980), Hecker and Blechschmidt (1979), Opresko (1980), Thoma et al. (2009), and Valentine et al. (1980). Species include the stony corals *Desmophyllum dianthus, Lophelia pertusa, Flabellum alabastrum, Javania cailleti;* soft corals *Anthomastus agassizii, Anthomastus grandiflorus, Clavularia rudis, Duva (= Capnella) florida*, *Paragorgia arborea, Primnoa resedaeformis, Acanthogorgia armata*, *Anthothela grandiflora*, *Acanella arbuscula, Paramuricea grandis, Thouarella grasshoffi*; and sea pens *Pennatula aculeata*, *Distichoptilum gracile.*

Map 252 – Lydonia/Gilbert/Oceanographer canyon HAPC with overlapping management areas



Map 253 – Lydonia, Gilbert, and Oceanographers Canyons HAPC



3.1.8.3 Hydrographer Canyon HAPC, preferred alternative

The Hydrographer Canyon HAPC is characterized below with respect to geomorphology and presence of deep-sea corals. Boundaries are mapped below with depth shading and contours for reference.

Hydrographer is a large canyon that incises the shelf by 15 km and extends seaward to the continental rise (Pratt 1967). Substrate sampling in the canyon has been limited, with a single ALVIN dive finding steep walls, a muddy bottom, and glacial erratics. An updated bathmetric map of Hydrographer Canyon was produced during a NOAA ship Okeanos Explorer cruise during May and June 2012.

Submersible dives during 1971-1986 and a later dive during 2001 found a diverse faunal community, but few coral species. More recently, a July 2013 cruise aboard the Okeanos Explorer conducted remotely operated vehicle transects along the west and east walls of Hydrographer Canyon, finding a diversity of coral and sponge species on the walls.

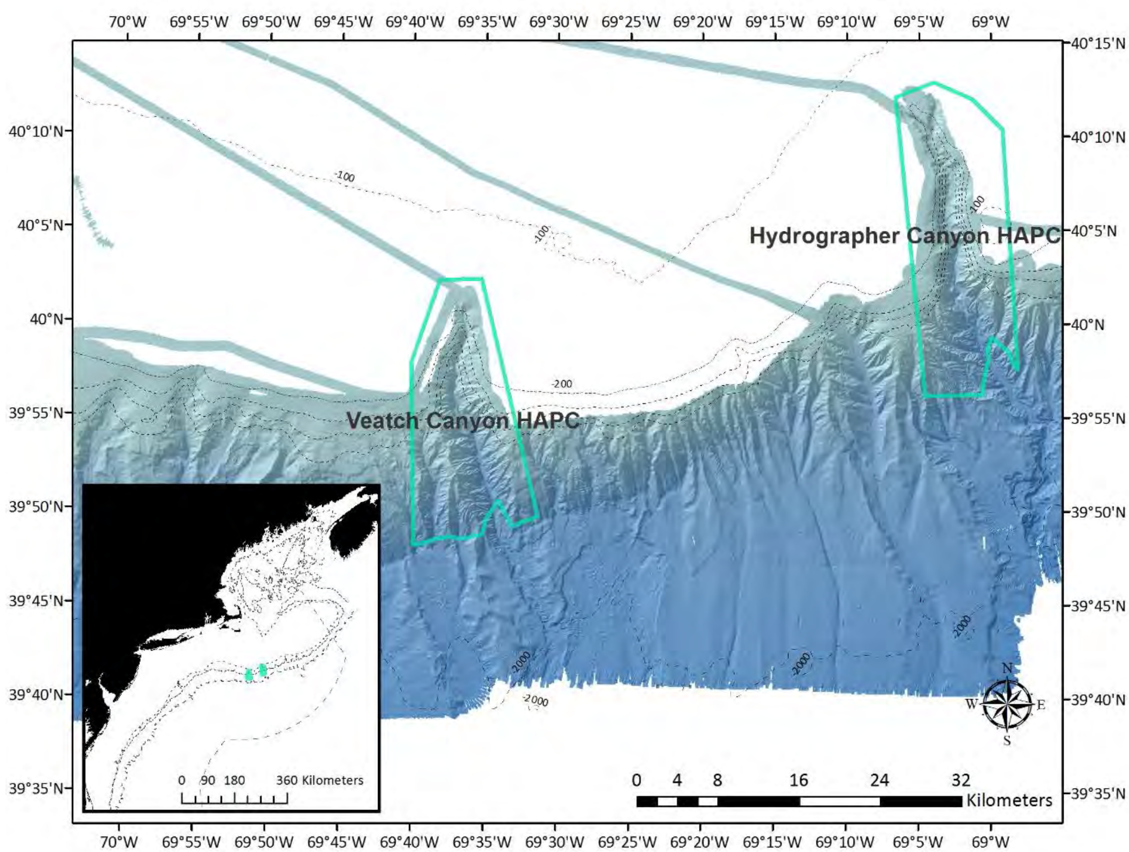
3.1.8.4 Veatch Canyon HAPC, preferred alternative

The Veatch Canyon HAPC is characterized below with respect to geomorphology and presence of deep-sea corals. Boundaries are mapped below with depth shading and contours for reference. While the canyon extends into deeper water the HAPC is limited to the maximum depth of designated EFH, 1500 meters.

Veatch is a moderately sized canyon with a broad channel extending onto the continental rise (Pratt 1967). Bathymetric and seismic surveys were conducted in 1975 (see Forde 1981). An updated bathmetric map of Veatch Canyon was produced during a NOAA ship Okeanos Explorer cruise during February 2012. Limited shallow submersible dives in the canyon head identified sandy sediments with major clay outcrops.

Previous investigations of coral fauna were sparse, but recently work in Veatch Canyon was done to groundtruth a coral habitat suitability model. Four dives conducted during a July 2012 cruise aboard the NOAA survey vessel Henry B. Bigelow identified high abundances of paramuricid corals along with solitary hard corals and various sponges living on the canyon walls. The 2013 Northeast U.S. Canyons Expedition aboard the Okeanos Explorer also visited Veatch Canyon.

Map 254 – Hydrographer Canyon HAPC and Veatch Canyon HAPC



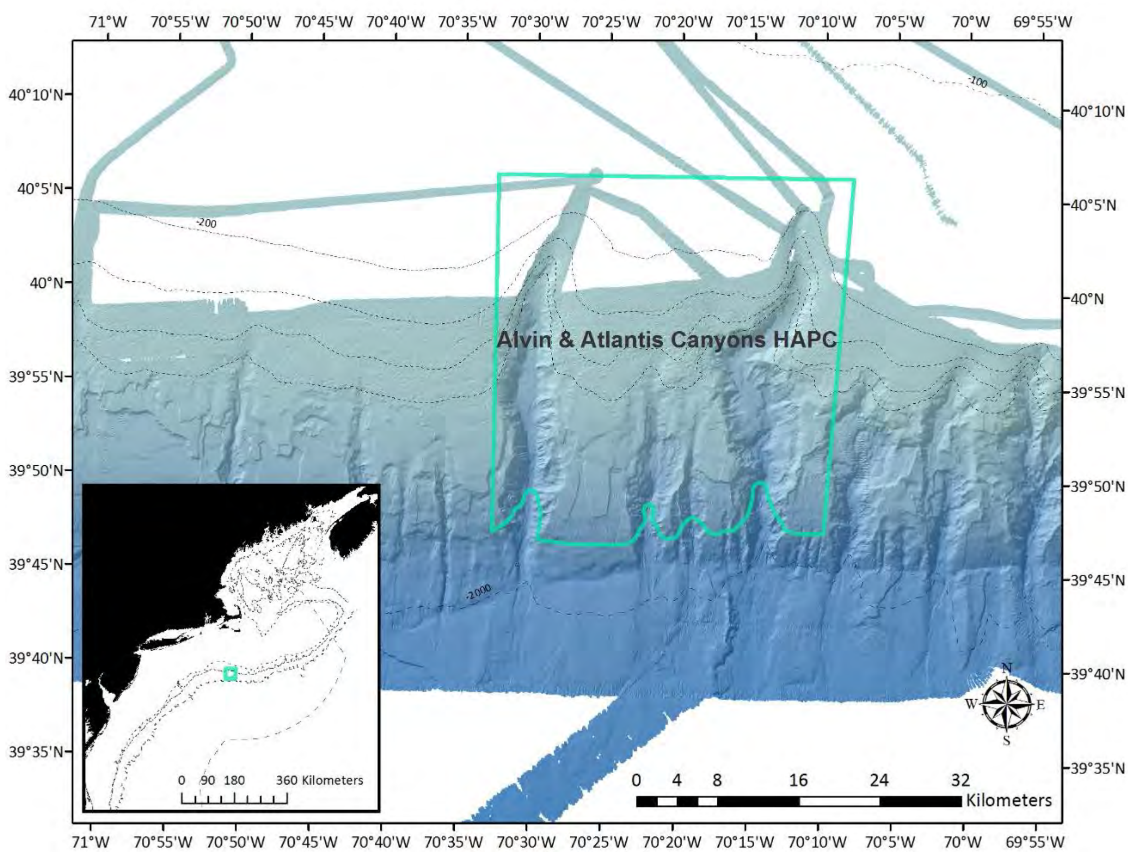
3.1.8.5 Alvin and Atlantis Canyon HAPC, preferred alternative

Alvin and Atlantis Canyons are combined into a single HAPC. Boundaries are mapped on the following page with depth shading and contours for reference. Atlantis is the eastern of the two canyons. While the canyons extend into deeper water the HAPC is limited to the maximum depth of designated EFH, 1500 meters.

An updated bathmetric map of Atlantis Canyon was produced during a NOAA ship Okeanos Explorer cruise during February 2012. Alvin Canyon was mapped shortly thereafter during May and June 2012.

There have been no surveys for corals in either canyon. However, Habitat Plan Development Team analysis indicated that vertical relief of Alvin Canyon from the canyon rim to the seafloor at the shelf break is relatively high, which indicates that suitable coral habitats are likely present. A more rigorous modeling study to predict whether suitable habitats for corals are likely to be present indicated that both canyons likely contain suitable habitats for soft corals. The first leg of the 2013 Northeast U.S. Canyons expedition included dives in both Alvin and Atlantis Canyons that found a highly diverse and apparently unique set of species in each location. Additional bathymetric data were also collected during the cruise.

Map 255 – Alvin and Atlantis Canyons HAPC

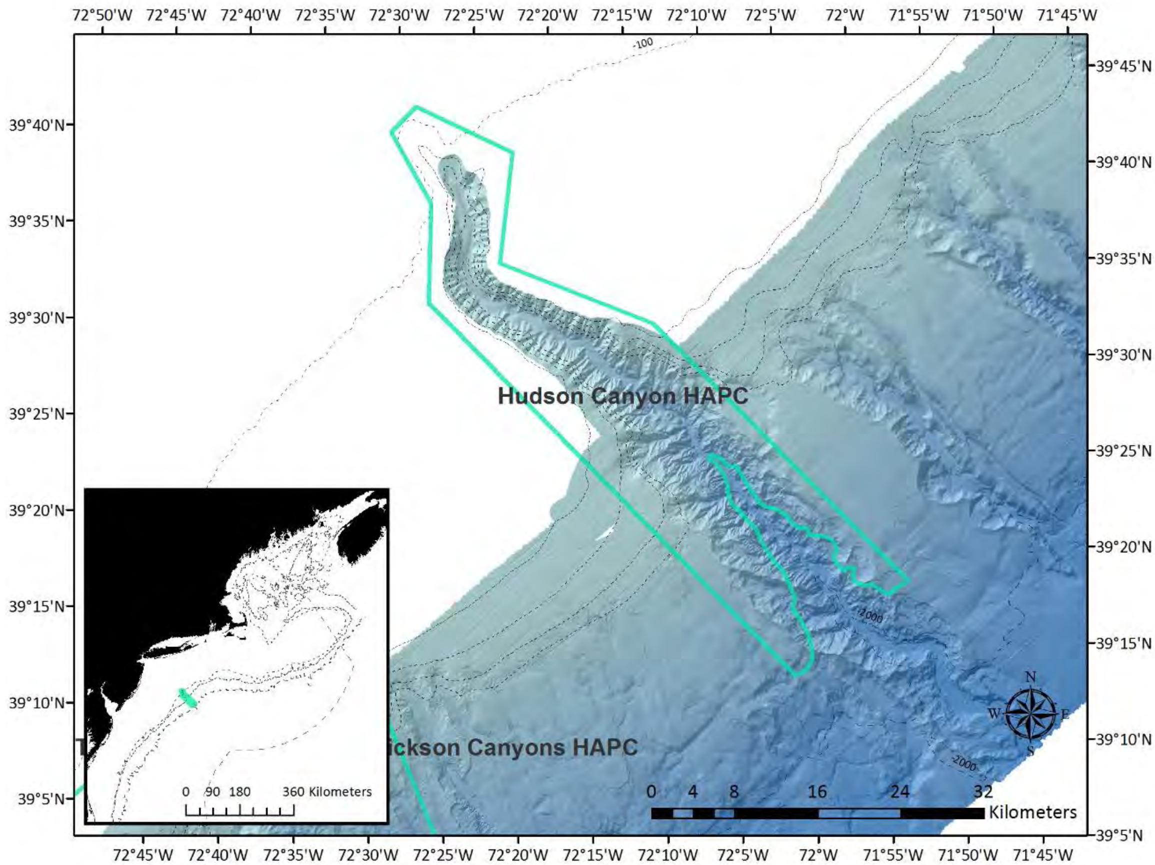


3.1.8.6 Hudson Canyon HAPC, preferred alternative

The Hudson Canyon HAPC is characterized below with respect to geomorphology and presence of deep-sea corals. Boundaries are mapped on the following page with depth shading and contours for reference.

Hudson is by far the largest canyon in the New England and Mid-Atlantic regions. It incises the shelf by roughly 30 km and extends a total of 80 km from its head to the base of the continental slope at 2,200 m depth (Pratt 1967), with walls attaining a maximum relief of about 1200 m and rim-to-rim width of approximately 5-10 km at the base of the slope. The canyon extends around 450 km further down the continental rise (depth to about 5000 m) to the Hatteras Abyssal Plain (Rona et al. 2015). The first low resolution multibeam bathymetry of Hudson Canyon was obtained by the Woods Hole Oceanographic Institution in 1997. A high resolultion multibeam bathymetric survey of the first 11 km of the canyon was conducted by the U.S. Geological Survey in 2002, and and the first 24 km were subsequently were surveyed by NMFS and collaborators during 2007-2009. Imagery of rock outcrops from the eastern wall of upper canyon were obtained during a joint effort by NEFSC and USGS in 2004 and their full extent within the first 5 km of the canyon was seen in backscatter from the 2007-2009 mapping data. That backscatter data also revealed additional patches of hard bottom in lower sections of the eastern wall between 12 and 24 km down-canyon (300-400 m depth) and numerous patches of hard bottom on the canyon floor at 500 – 600 m depth, interpreted as pock-mark fields associated with methane release from sediments starting at 15 km down-canyon (Pierdomenico et al. 2015). The entirety of the shelf-incising portion of Hudson Canyon has been mapped at high resolution twice since then by *Okeanos Explorer* (2012, 2013), but that data has not yet been examined for potential hard bottom features as of 2016. Hecker and Blechschmidt (1979) evaluated six ALVIN dives further down-canyon and noted predominantly silty sediments with substantial rock outcrops in waters between 2,900-3,000 meters. Few corals were noted in these dives. In general, explored regions of Hudson Canyon appears to have sea pens and small cup corals, but larger specimens of gorgonians had not been found as of 2016. However, much of the canyon, including known areas of hard bottom and mapped, but uncharacterized region between 24 km down-canyon and the Alvin dives of Hecker and Blechschmidt (1979), remains unexplored by visual means.

Map 256 – Hudson Canyon HAPC

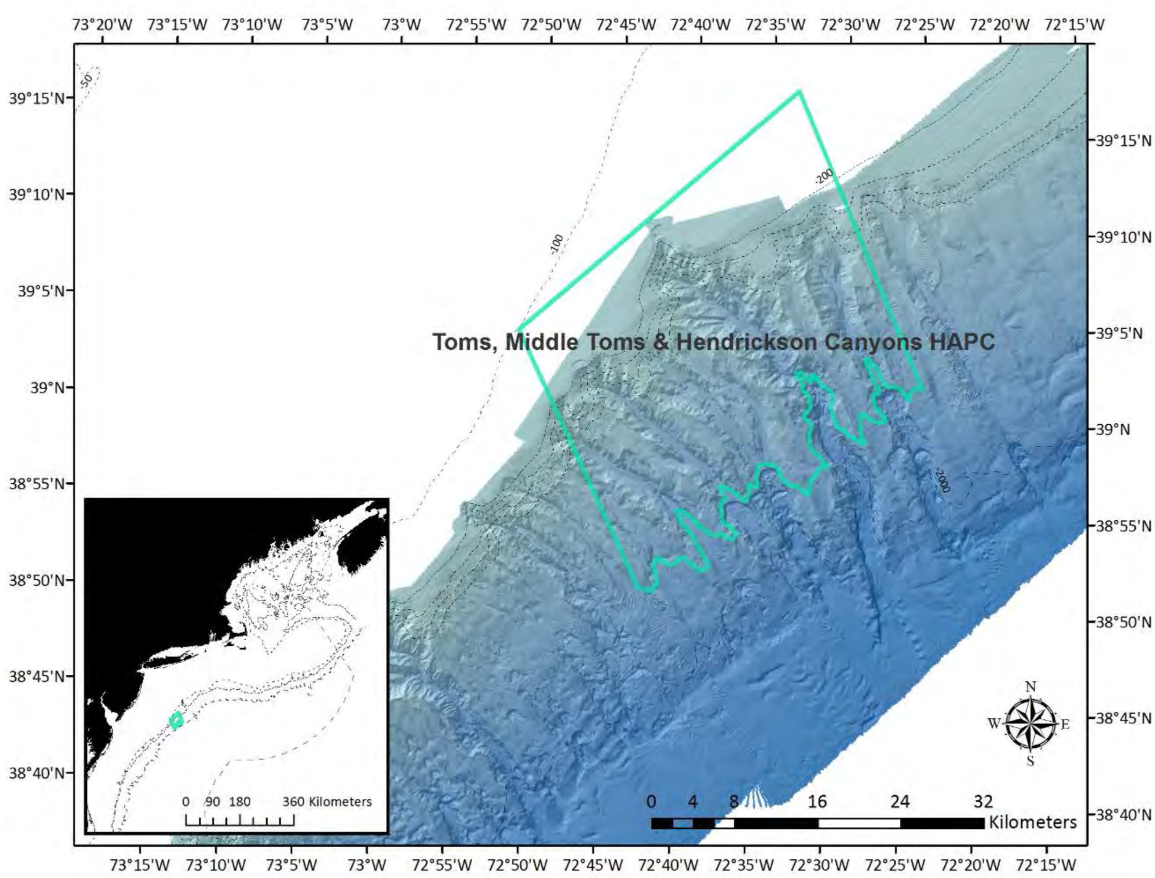


3.1.8.7 Toms, Middle Toms, and Hendrickson Canyon HAPC, preferred alternative

The Toms Canyon complex is topographically and geologically complex, with rather unique sedimentary rock outcrop features. In particular, submersible dives near Berkley Canyon have documented exposed chalky sedimentary rocks dissected by furrows, and these same features were inferred to adjacent slope areas by comparing side scan sonar imagery between the dive site and adjacent sites (Robb et al 1983). These exposed rocks are suitable for coral attachment. Various types of corals have been found in the area, including species that inhabit soft sediments and species that require bedrock or other hard substrates for attachment (Hecker and Blechschmidt 1979), Hecker et al. 1983).

These canyons differ from those described above in that they generally to not incise the continental shelf. Recent multibeam acoustic mapping has updated the bathymetric characterization of this complex. These data were collected during cruises aboard the Okeanos Explorer (October 2011, February 2012, May/June 2012) and Ferdinand R. Hassler (June 2012). Subsequent to the acoustic studies, a July 2012 groundtruthing cruise conducted camera tows in Toms, Middle Toms, and Hendrickson Canyons, with the intent of evaluating coral presence in areas of model-predicted high habitat suitability. A diversity of organisms including corals were found during these camera tows. Most of the corals were octocorals, with fewer stony corals and sea pens observed. While corals were noted on every tow, of the areas examined the greatest abundances were found in Middle Toms Canyon.

Map 257 – Toms, Middle Toms, and Hendrickson Canyon HAPC



3.1.8.8 Wilmington Canyon HAPC, preferred alternative

The Wilmington Canyon HAPC is characterized in the table below with respect to geomorphology and presence of deep-sea corals. Boundaries are mapped on the following page with depth shading and contours for reference.

Pratt (1967) described Wilmington Canyon as fairly well incised into the shelf (16 km, same as Baltimore Canyon); when including its extension into the continental rise, the second largest canyon in Northeastern United States, extending 312 km from the 2,000 m contour. As compared to the larger Hudson Canyon, Wilmington has about two-thirds the vertical relief. An updated bathymetric map of Wilmington Canyon was generated during an October 2011 cruise aboard the Okeanos Explorer. An August 2014 cruise aboard the Henry Bigelow used a towed camera system to explore Wilmington Canyon.

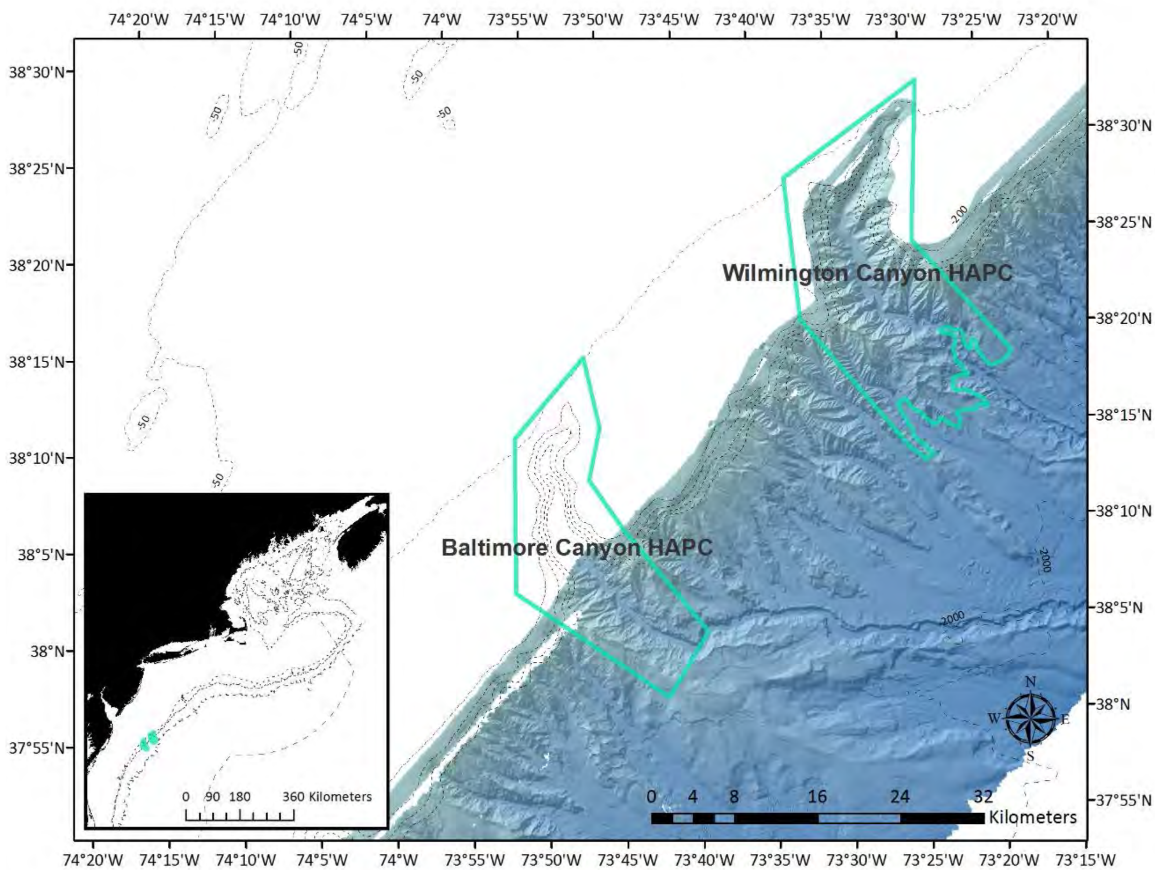
3.1.8.9 Baltimore Canyon HAPC, preferred alternative

The Baltimore Canyon HAPC is characterized in the table below with respect to geomorphology and presence of deep-sea corals. Boundaries are mapped on the following page with depth shading and contours for reference.

The morphology of Baltimore Canyon was described by Pratt (1967), Thompson et al. (1980) and Hecker et al. (1983). An updated bathymetric map of Baltimore Canyon was generated during a June 2011 cruise aboard the Nancy Foster. Deeper areas were mapped in October 2011 aboard the Okeanos Explorer. Thompson et al. (1980), Hecker et al. (1980, 1983) evaluated sediment distribution in Baltimore Canyon. Baltimore is a relatively large, broad canyon where it incises the continental shelf, although it does not extend very far onto the continental rise.

A diverse coral fauna was found by Opresko (1980) and Hecker et al. (1980, 1983), including the stony corals *Dasmosmilia lymani* near head of Canyon , *Flabellum alabastrum* found on slope south of Canyon, *Desmophyllum dianthus;* soft corals *Anthomastus agassizii?, Anthomastus grandiflorus, Capnella florida*, *Acanella arbuscula* on slope just south of Canyon, *Paragorgia arborea*, *Primnoa resedaeformis, Acanthogorgia armata*, *Anthothela grandiflora*; and sea pens: *Kophobelemnon stelliferum* common on slope north of Baltimore Canyon (Opresko 1980), *Distichoptilum gracile, Stylatula elegans*. An additional sea pen, *Virgularia mirabilis* (Müller, 1776), was mentioned in Hecker and Blechschmidt (1980). A recent Bureau of Ocean Energy Management study included remotely operated vehicle dives in Baltimore Canyon. Dense aggregations of several coral species were noted, and species *Lophelia pertusa* was observed for the first time in mid-Atlantic waters during the cruise.

Map 258 – Wilmington Canyon HAPC and Baltimore Canyon HAPC



3.1.8.10 Washington Canyon HAPC, preferred alternative

The Washington Canyon HAPC is characterized in the table below with respect to geomorphology and presence of deep-sea corals. Boundaries are mapped on the following page with depth shading and contours for reference.

Pratt (1967) characterized the morphology of the canyon, and bathymetric and seismic surveys were conducted in 1975 as described in Forde 1981. An updated bathymetric map of Washington Canyon was generated during a June 2011 cruise aboard the Nancy Foster. Deeper areas were mapped in October 2011 aboard the Okeanos Explorer. Washington is a relatively small canyon that incises the shelf approximately 10 km, but it does have a relatively long seaward extension onto the continental rise. An August 2014 cruise aboard the Henry Bigelow used a towed camera system to explore Washington Canyon.

3.1.8.11 Norfolk Canyon HAPC, preferred alternative

The Norfolk Canyon HAPC is characterized in the table below with respect to geomorphology and presence of deep-sea corals. Boundaries are mapped on the following page with depth shading and contours for reference.

Pratt (1967) characterized the morphology of the canyon, and bathymetric and seismic surveys were conducted in 1975 as described in Forde 1981. An updated bathymetric map of Baltimore Canyon was generated during a June 2011 cruise aboard the Nancy Foster. Deeper areas were mapped in October 2011 aboard the Okeanos Explorer. Norfolk Canyon incises shelf for distance of 14.5 km. While it is a sharper and longer canyon than Washington where it cuts across the continental shelf, it soon dies out in the deep sea and merges with Washington Canyon.

Hecker and Blechschmidt (1979) and Malahoff et al. (1982) summarized the substrate and coral fauna of Norfolk Canyon. Sediments are predominantly silty with substantial outcrops between 1050 and 1500 m and only occasional outcrops in deeper water. A variety of stony corals, soft corals, and sea pens were documented by these two studies and by Opresko (1980) including the stony corals *Desmophyllum dianthus* occasionally on axis of Canyon, *Flabellum alabastrum* found in deeper parts of the continental slope south of Canyon and in axis of Canyon on soft substrate; the soft corals *Anthomastus grandiflorus* axis of Canyon, *Gersemia fruticosa* at the mouth of Canyon, *Paragorgia arborea, Primnoa resedaeformis, Acanthogorgia armata* occasionally in axis of Canyon on exposed outcrops, and sea pens: *Pennatula aculeata*. Older coral records are included in a Smithsonian Institution database. A recent Bureau of Ocean Energy Management study included remotely operated vehicle dives in Norfolk Canyon. Dense aggregations of several coral species were noted, and species *Lophelia pertusa* was observed for the first time in mid-Atlantic waters during the cruise.

Map 259 – Washington Canyon HAPC and Norfolk Canyon HAPC