3.0 DESCRIPTION AND IDENTIFICATION OF ESSENTIAL FISH HABITAT

The regulatory text of the Interim Final Rule (*Federal Register* Vol. 62 No. 244, December 19, 1997) directs the Council to describe EFH in text and with tables that provide information on the biological requirements for each life history stage of the species. These tables are provided in the individual species reports (Appendix A) and summarize all available information on environmental and habitat variables that control or limit distribution, abundance, reproduction, growth, survival, and productivity of the managed species.

The regulatory text of the Interim Final Rule also directs the Council to present the general distribution and geographic limits of EFH for each life history stage in the form of maps. These maps are presented as fixed in space and time, but they encompass all appropriate known temporal and spatial variability in the distribution of EFH. The EFH maps are a means to visually present the EFH described in the amendment.

There are two distinct but related components of the process to comply with the guidelines of the Interim Final Rule: (1) developing the text description of essential fish habitat; and, (2) identifying the geographic extent of essential fish habitat. Together, they provide a picture of the EFH for Council-managed species. Table 4 lists the species, and their common names, for which the Council is designating EFH.

3.1 DESCRIPTION OF ESSENTIAL FISH HABITAT

To support the Council, NMFS developed source document reports for each species managed by the Council, with the exception of Atlantic salmon. These reports consist of literature reviews documenting the life history and habitat requirements of the species, as well as food habits information and distribution and abundance information by life history stage. The species report for Atlantic salmon was developed by the Council, with information from NMFS, the U.S. Fish and Wildlife Service, and the Maine Atlantic Salmon Authority. These reports are provided in Appendix A. The information presented in the species reports was used to develop the EFH text descriptions for all species.

The text descriptions of essential fish habitat set the environmental parameters within which the map designations are considered. NMFS regulations within the Interim Final Rule require that the text description take precedence when the text and EFH maps differ. These text descriptions identify the habitat requirements for each species by life history stage. They include the general geographic area(s) preferred by the species, the preferred substrate (if demersal), and ideal ranges of water temperature, depth, and salinity (where known). The descriptions reflect the best available information on the species' habitat requirements collected from the scientific literature and observations made during research surveys. Where information was available, the text descriptions also identify those bays and estuaries designated as EFH, based on the observed relative abundance of the species. For maps of the bays and estuaries considered by the Council, please refer to Appendix B.

Table 4: Council-managed species requiring EFH designations.*

FMP	Species	Common Names
Multispecies (Groundfish)	*Gadus morhua*	Atlantic cod (official) rock cod
Multispecies	*Glyptocephalus cynoglossus*	witch flounder (official) gray sole Craig fluke pole flounder
Multispecies	*Hippoglossoides platessoides*	American plaice (official) American dab Canadian plaice long rough dab
Multispecies	*Pleuronectes ferruginea*	yellowtail flounder (official) rusty flounder
Multispecies	*Macrozoarces americanus*	ocean pout (official) eelpout Congo eel muttonfish
Multispecies	*Melanogrammus aeglefinus*	haddock (official)
Multispecies	*Merluccius bilinearis*	whiting (official) silver hake New England hake
Multispecies	*Pollachius virens*	pollock (official) Boston bluefish coalfish green cod
Multispecies	*Pleuronectes americanus*	winter flounder (official) blackback Georges Bank flounder lemon sole sole flatfish rough flounder mud dab black flounder
Multispecies	*Scophthalmus aquosus*	windowpane flounder (official) sand flounder spotted flounder New York plaice sand dab spotted turbot

FMP	Species	Common Names
Multispecies	*Sebastes* spp.	redfish (official) rosefish ocean perch red sea perch red bream Norway haddock
Multispecies	*Urophycis chuss*	red hake (official) squirrel hake ling
Multispecies	*Urophycis tenuis*	white hake (official) Boston hake black hake mud hake ling
Multispecies	*Hippoglossus hippoglossus*	Atlantic halibut (official)
Monkfish	*Lophius americanus*	monkfish (official) American goosefish angler allmouth molligut fishing frog
Sea Scallop	*Placopecten magellanicus*	Atlantic sea scallop (official) giant scallop smooth scallop deep sea scallop Digby scallop
Atlantic Herring	*Clupea harengus*	Atlantic sea herring (official) Labrador herring sardine sperling brit
Atlantic Salmon	*Salmo salar*	Atlantic salmon (official) sea salmon silver salmon black salmon

***** Common names as listed in Bigelow, H.R. and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish Wildl. Serv., Fish. Bull. 53. 577pp. The "official" common name is the one used by the NEFMC and is the name used in this document.

3.2 IDENTIFICATION OF ESSENTIAL FISH HABITAT

The map designations of essential fish habitat identify the geographic extent within which certain types of habitat are considered EFH. EFH must be designated according to the level of information available on the species distribution, abundance, and habitat-productivity relationships. The levels of information, as defined in the Interim Final Rule, are:

- Level 1: Presence / absence data are available for portions of the range of the species. At this level, only presence / absence data are available to describe the distribution of a species (or life history stage) in relation to potential habitats. In the event that distribution data are available for only portions of the geographic area occupied by a particular life history stage of a species, EFH can be inferred on the basis of distributions among habitats where the species has been found and on information about its habitat requirements and behavior.

- Level 2: Habitat-related densities are available. At this level, quantitative data (i.e., density or relative abundance) are available for the habitats occupied by a species of life history stage. Density data should reflect habitat utilization, and the degree that a habitat is utilized is assumed to be indicative of habitat value. When assessing habitat value on the basis of fish densities in this manner, temporal changes in habitat availability and utilization should be considered.

- Level 3: Growth, reproduction, and survival rates within habitats are available. At this level, data are available on habitat-related growth, reproduction, and/or survival by life history stage. The habitats contributing the most to productivity should be those that support the highest growth, reproduction, and survival of the species (or life history stage).

- Level 4: Production rates by habitat are available. At this level, data are available that directly relate the production rates of a species of life history stage to habitat type, quantity, and location. Essential habitats are those necessary to maintain fish production consistent with a sustainable fishery and the managed species' contribution to a healthy ecosystem.

Table 5 displays the level of information available for each species' EFH designation. For most species, the best information consists of relative abundance and distribution data (Level 2) and presence / absence data (Level 1). In a few cases, some Level 3 information is available, but there is a definite lack of detailed and scientific information relating fish productivity to habitat type, quantity, quality and location. Guidance provided by NMFS in the Interim Final Rule suggests that when working only with Level 1 and Level 2 data, "the degree that a habitat is utilized is assumed to be indicative of habitat value." In other words, if all that is known is where the fish tend to be in relatively high concentrations, these areas are assumed to be the essential fish habitat. This is the approach the Council has adopted, using relative densities and areal extent to determine the EFH designations.

Table 5: Sources and Levels of EFH Information *

Species	eggs	larvae	juvenile	adult	spawners
American plaice	2	2	2	2	1
Atlantic halibut	0	0	1	1	1
Atlantic herring	1	2	2	2	1
Atlantic salmon	1	1	1	1	1
Atlantic cod	2	2	3	2	1
haddock	2	2	2	2	1
monkfish	0	1	2	2	1
ocean pout	0	0	2	2	1
pollock	2	2	2	2	1
red hake	2	2	2	2	1
redfish	N/A	2	2	2	1
Atlantic sea scallops	0	0	0	2	1
white hake	0	0	2	2	1
whiting	2	2	2	2	1
windowpane flounder	2	2	2	2	1
winter flounder	1	2	2	2	1
witch flounder	2	2	2	2	1
yellowtail flounder	2	2	2	2	1

***** The numbers represent the highest available level of information available for each life history stage. Level "0" indicates that there is very little information available for this life history stage. "N/A" indicates that this does not exist as a distinct life history stage for this species. Please see page 3 for an explanation of the information levels.

3.2.1 Sources of Information

There are several sources of distribution and abundance data used to develop the EFH designations. The NMFS bottom trawl survey (1963 - 1997) and the NMFS Marine Resources Monitoring, Assessment and Prediction (MARMAP) ichthyoplankton survey (1977 - 1987) provide the best available information on the distribution and relative abundance of Council-managed species in offshore waters. The bottom trawl survey is used for juveniles and adults, and the MARMAP survey is used for eggs and larvae. The Council used other sources of information on inshore areas, including the Massachusetts inshore trawl survey (1978 - 1997), information from Long Island Sound (1990 - 1996), and NOAA's Estuarine Living Marine Resources (ELMR) program. Data on the distribution and relative abundance of fish in other inshore areas, especially estuaries and embayments, were not available in a timely manner in some cases. The Council also considered information provided by the fishing industry, as well as several sources of historical information. Information on the distribution and abundance of sea scallops was obtained primarily from the NMFS sea scallop survey (1982 - 1997) and from representatives of the scallop fishing industry. Information on the range and distribution of Atlantic salmon was obtained primarily from the available literature. Detailed descriptions of the surveys and databases used by the Council in the EFH designation process, including the sampling protocols and methods, are provided in Appendix C. A detailed discussion of the limitations associated with using these data and information sources as the basis for designating EFH is provided in Appendix D.

3.2.2 ELMR Program Information

Used by the Council as the primary source of information on species distribution and abundance in the bays and estuaries of New England and the Mid-Atlantic, NOAA's Estuarine Living Marine Resources (ELMR) program has been conducted jointly by the Strategic Environmental Assessments (SEA) Division of NOAA's Office of Ocean Resources Conservation and Assessment (ORCA), NMFS, and other agencies and institutions. The goal of this program is to develop a comprehensive information base on the life history, relative abundance and distribution of fishes and invertebrates in estuaries throughout the nation. The nationwide ELMR database was completed in 1994, and includes information for 135 species found in 122 estuaries and coastal embayments. The Jury *et al.* (1994) report summarizes information on the distribution and abundance of 58 fish and invertebrate species in 17 North Atlantic estuaries. The Stone *et al.* (1994) report summarizes information on the distribution and abundance of 61 fish and invertebrate species in 14 Mid-Atlantic estuaries.

Most existing estuarine fisheries data cannot be compared among estuaries because of the variable sampling strategies. In addition, existing research programs do not focus on how groups of estuaries may be important for regional fishery management. The ELMR program was developed to integrate fragments of information on many species and their associated habitats into a useful, comprehensive and consistent format. The framework employed for the ELMR program enables a consistent compilation and organization of all available data on the distribution and abundance of fishes and invertebrates in estuaries. For the New England region, thirteen north Atlantic estuaries were selected from the

National Estuarine Inventory (NEI) Data Atlas Volume I, and after discussions with several regional researchers, four additional estuaries were included. Although not every New England or mid-Atlantic estuary is addressed, thirty-one estuaries are included in the Jury *et al.* (1994) and Stone *et al.* (1994) reports:

- Passamaquoddy Bay
- Englishman/Machias Bays
- Narraguagus Bay
- Blue Hill Bay
- Penobscot Bay
- Muscongus Bay
- Damariscotta River
- Sheepscot River
- Kennebec/Androscoggin Rivers
- Casco Bay
- Saco River
- Wells Harbor
- Great Bay
- Merrimack River
- Massachusetts Bay
- Boston Harbor
- Cape Cod Bay
- Waquoit Bay
- Buzzards Bay
- Narragansett Bay
- Connecticut River
- Gardiners Bay
- Long Island Sound
- Great South Bay
- Hudson River/Raritan Bay
- Barnegat Bay
- New Jersey Inland Bays
- Delaware Bay
- Delaware Inland Bays
- Chincoteague Bay
- Chesapeake Bay

Project staff compiled species distribution and abundance information for these estuaries by conducting exhaustive literature searches and examining published and unpublished data sets. To complement the information from these quantitative studies, regional, state, and local biologists were interviewed for their knowledge of estuary/species-specific spatial and temporal distribution patterns and relative abundance levels based upon their experience and research. The final level of relative abundance assigned to a particular species was determined from the available data and expert review. To rank relative abundance, ELMR staff used the following categories:

- *Not present* -- species or life history stage not found, questionable data as to identification of species, and/or recent loss of habitat or environmental degradation suggests absence.
- *No information available* -- no existing data available, and after expert review it was determined that not even an educated guess would be appropriate. This category was also used if the limited data available were extremely conflicting and/or contradictory; in these cases, *no information available* actually describes a situation where the available information was indecipherable.
- *Rare* -- species is definitely present but not frequently encountered.
- *Common* -- species is frequently encountered but not in large numbers; does not imply a uniform distribution over a specific salinity zone.
- *Abundant* -- species is often encountered in substantial numbers relative to other species with similar life modes.
- *Highly abundant* -- species is numerically dominant relative to other species with similar life modes. The Council considers the *abundant* and *highly abundant* categories to be the same for the purposes of designating EFH.

For many well-studies species, quantitative data were used to estimate spatial and temporal distributions. For other species, however, reliable quantitative data were

limited. Therefore, nearly all information used in the reports were submitted to panels of local researchers, managers, and technicians for peer review based upon their knowledge of individual species within an estuary. More than 72 scientists and managers at 33 institutions were consulted (the ELMR reports list the individuals and their affiliations). An important aspect of the ELMR program, because it is based primarily on literature and consultations, was to determine the reliability of the available information. The reliability of available information varied between species, life stage, and estuary, due to differences in gear selectivity, difficulty in identifying larvae, difficulty in sampling various habitats, and the extent of sampling and analysis in particular studies. Data reliability was classified using the following categories:

- *Highly certain* -- considerable sampling data available. Distribution, behavior, and preferred habitats well documented within the estuary.
- *Moderately certain* -- some sampling data available for the estuary. Distribution, preferred habitat, and behavior well documented in similar estuaries.
- *Reasonable inference* -- little or no sampling data available. Information on distributions, ecology, and preferred habitats documented in similar estuaries.

The ELMR information, as presented, should be considered "Level 1" data, as defined in the Interim Final Rule. Guidance in the Interim Final Rule suggests that when working only with Level 1 data, "presence / absence data should be evaluated . . . to identify those habitat areas most commonly used by the species." As it relates to the information presented in the ELMR reports, estuaries where a particular species is *abundant* are assumed to be more commonly used than estuaries where a particular species is *rare*. More commonly used estuaries should be considered in the designation of essential fish habitat.

Several members of the Council's EFH Technical Team had direct involvement with the process for developing the ELMR information, either as interviewees or as reviewers. In their experience, all levels of data reliability provide sound information for use in determining the presence or absence of a species within an estuary. Information classified on the basis of *reasonable inference* may not be based on directed research to assess the abundance of a particular species within an estuary, but it does reflect the professional experience and personal knowledge of scientists and managers intimately involved with the species and estuaries in question. Information of a dubious nature, or information that is not verifiable would be categorized as *no information available* and the species would therefore not appear as *rare*, *common*, *abundant*, or *highly abundant* in an estuary.

The Council determined that the information presented in the ELMR reports met the qualifications of the Interim Final Rule for "Level 1" data, and as such, should be considered and incorporated into the EFH designation process. Although the NMFS ichthyoplankton and bottom trawl survey remained the primary source of information for designating EFH, the ELMR reports serve as "additional information."

Although the Council reserved the right to evaluate individually the appropriate EFH designations based on the ELMR information, the following provides a general guide for how the Council applied the information. For those species' life history stages for which the Council designated EFH based on the 100% alternative (i.e., EFH is designated as 100% of the range observed for the species' life history stage), all estuaries in which the species' life history stage is categorized as *rare*, *common*, *abundant*, or *highly abundant* were included in the EFH designation. For those species' life history stages for which the Council designated EFH based on the 90% alternative, all estuaries in which the species' life history stage is categorized as *common*, *abundant*, or *highly abundant* were included in the EFH designation. Species for which the 50% or 75% alternative was used, all estuaries in which the species' life history stage is categorized as *abundant* or *highly abundant* were included in the EFH designation.

3.2.3 EFH Alternatives

The alternatives considered by the Council are based on the relative densities of fish observations. For all species, a set of alternatives was developed for each of the major life history stages, with the exception of sea scallops, Atlantic salmon, and Atlantic halibut. Those stages include eggs, larvae, juveniles, and adults. The maps presenting the alternatives display the distribution and abundance data by ten minute squares of latitude and longitude. This is the most efficient and understandable spatial scale for use in this process because the NMFS distribution and abundance data were easily represented by ten minute squares and the data can be compared to other data sets, information from the fishing industry, and existing management measures. A map with the grid of ten minute squares can be viewed in Figure 4.

The Council used two methods for developing the EFH designations: one based on catch-per-unit-effort per ten minute square, and the other based on straight percentages of observed range. The catch-per-unit-effort method was used for all demersal life history stages (juveniles and adults of all species with the exception of Atlantic herring and Atlantic salmon). The percentage of observed range method was used for all planktonic life history stages (eggs and larvae of most species) and the juvenile and adult stages of the pelagic schooling Atlantic herring. The "observed range" for each species includes all areas where the species was observed by either the NMFS bottom trawl or MARMAP surveys.

Selection factors were applied to the bottom-trawl and ichthyoplankton survey databases to construct the data sets for the Council alternatives and EFH designation maps. The selection factors were recommended by NMFS Northeast Fisheries Science Center (NEFSC) scientists who collected and work with the data. Correction factors were used to standardize the bottom-trawl catch of various species due to variation in doors, trawls, and/or vessels among the surveys. Correction factors were applied to specific species (see Appendix C, Methods Report, Table 4). After the bottom-trawl and ichthyoplankton data were selected, the summarization process was the same. Data were assigned to a ten minute square based on the location of the starting point of the bottom-trawl or ichthyoplankton sample tow. Only those squares that had greater than three samples and one positive catch were selected. Catch data were transformed by taking the natural

logarithm of the catch [ln(catch + 1)] and the mean of the transformed data was calculated for each ten minute square.

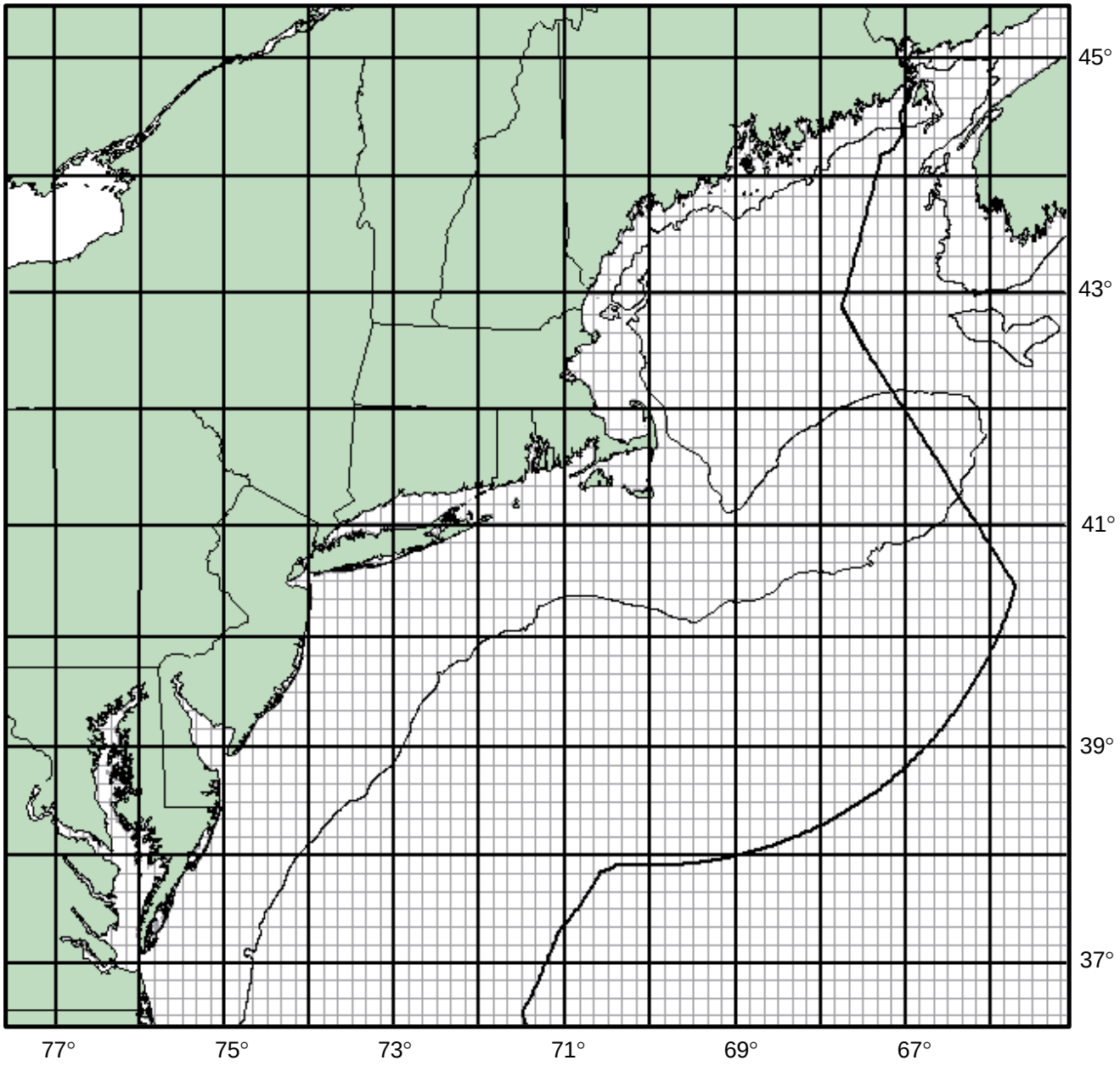
In analyzing the data for each species' life stage using the catch-per-unit-effort method, each ten minute square throughout the survey area and included in the analysis was ranked from highest to lowest according to an index of the mean catch per unit of effort of the survey (i.e., the number of fish caught in each tow of the survey trawl). For each life history stage, the alternatives considered include: (1) the area that comprises the top 50% of catch per unit effort abundance index, (2) the area that comprises the top 75% of catch per unit effort abundance index, (3) the area that comprises the top 90% of catch per unit effort abundance index, (4) 100% of the observed range of the species, and (5) no EFH designation (the status quo option).

In analyzing the data for each species' life stage using the straight area percentage method, each ten minute square throughout the survey area and included in the analysis was also ranked from highest to lowest according to an index of the mean catch per unit of effort of the survey. In this case, however, the alternatives represent the percentage of the overall area (the observed range) rather than a percentage of the catch-per-unit effort. For each life history stage, the alternatives considered include: (1) the area that comprises the top 50% of the observed range, (2) the area that comprises the top 75% of the observed range, (3) the area that comprises the top 90% of the observed range, (4) 100% of the observed range of the species, and (5) no EFH designation (the status quo option).

The former method was used because it accurately reflected that for most demersal life history stages, the population is rather concentrated in some portions its overall range, especially where environmental conditions such as habitat and prey resources were most favorable, and it is less concentrated in other portions of its overall range where environmental conditions are not as favorable. Clearly, EFH should be designated where environmental conditions, especially habitat, are most favorable, thus the highest percentages of the catch-per-unit-effort index were a suitable proxy for identifying these areas.

In the case of the planktonic life history stages and the pelagic schooling nature of juvenile and adult Atlantic herring, this method did not necessary capture the "area" most favorable to the species. Planktonic eggs tend to be clumped only immediately after a spawning event, and they soon after disperse rapidly and move with the prevailing currents. Currents and other oceanographic phenomenon tend to move and shift around the concentrations of planktonic eggs and larvae, and chance plays a large role in the eggs and larvae ending up in areas of the species' range where environmental conditions are most favorable. Other factors related to the sampling methods for these life stages also contribute to the catch-per-unit-effort method not being as appropriate (see Appendices C and D). The straight percentage method was used in these cases as a more inclusive process to better represent the areas where the species tended to be.

Figure 4: Map of Ten Minute Squares



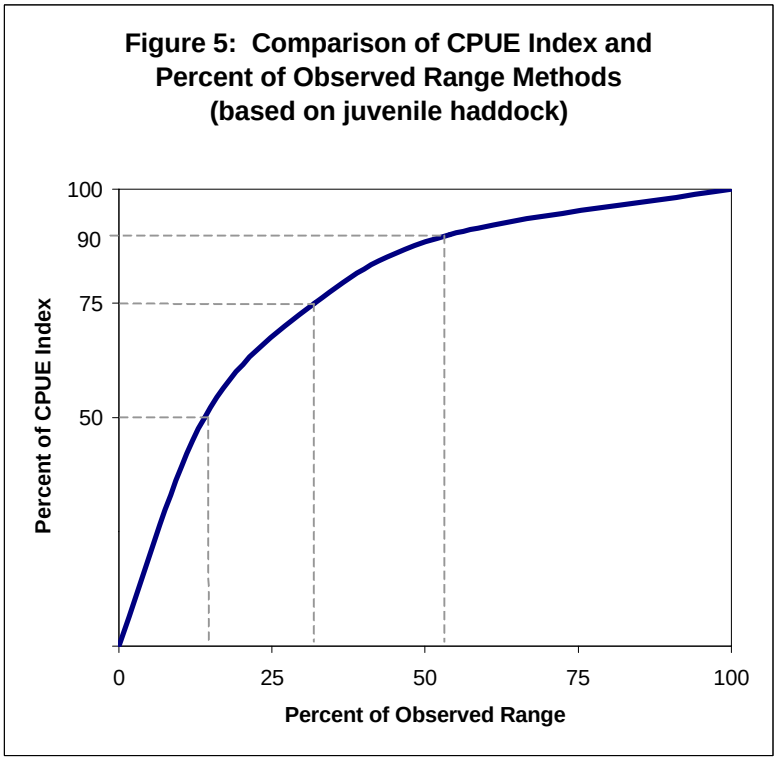


Figure 5 illustrates the comparison between these two related methods, using haddock juveniles as an example. In this case, 50% of the CPUE index is limited to 14% of the observed range and 90% of the CPUE index is limited to 54% of the observed range.

The no action or no EFH designation alternative was considered, but according to the Sustainable Fisheries Act, the Council is required to designate EFH for all managed species; thus, this alternative was not considered a valid option. For each life history stage of each species, the Council considered the remaining alternatives, selecting the EFH designation for each individually. The Council employed the most consistent approach possible, given the variety of species and unique characteristics of many of the life history stages and the limitations of the available data and information considered.

The Council's approach was focused on designating the smallest area possible that accounted for the majority of the observed catch, taking into account the habitat requirements of the species and any areas known to be important for sustaining the fishery. The Council considered the status of the resource, and was more conservative with those species considered overfished. The Council also considered the historic range of the species, including areas of historic importance, where appropriate. In some cases, the Council used a proxy to determine the most appropriate EFH designation for certain life history stages. This was done by applying the range of one life history stage as the EFH designation for another stage. The Council most often used a proxy designation when information was not available for a particular life history stage, but also used a proxy on occasion when the observed range of a particular life history stage did not accurately represent the true range.

The EFH designation for Atlantic salmon used a different approach. The unique life history characteristics of Atlantic salmon and the information available required a different set of alternatives, based not on relative abundance in any one ten minute square, but rather on the status of the populations of salmon within the rivers of New England. There were five categories of rivers considered for EFH designation by the Council: unique rivers (those currently part of the Atlantic salmon distinct population segment (DPS)); candidate rivers (those being considered for inclusion in the DPS); restoration rivers (those with active restoration projects); present rivers (those currently supporting Atlantic salmon); and, historic rivers (those that supported Atlantic salmon at one time but not at the present time).

The habitat description and identification for a managed species is based on the biological requirements and the distribution of the species. For all species, this includes a combination of state, federal, and international waters. According to the regulations, EFH can only be designated within U.S. federal or state waters. Although there may be areas outside of U.S. waters which are very important to Council-managed species, EFH can not be designated in Canadian waters or on the high seas. In cases where the range of a species extends into waters managed by the Mid-Atlantic Fishery Management Council (MAFMC), the NEFMC has designated EFH as long as the species is managed under a New England Fishery Management Council FMP. Accordingly, the maps representing the alternatives considered by the Council (provided in Section 12.3.3 of the Environmental Assessment) include those ten minute squares in Canadian waters where each species was caught in the NMFS surveys, but the actual EFH designations stop at the U.S - Canada boundary. The Council stresses that in many cases, habitat located in Canadian waters may be just as important, if not more important, than the habitat located in U.S. waters. The Council urges the Canadian government to examine this information and take complementary measures to ensure the adequate protection of this valuable habitat.

Quite often, the EFH designations appear quite patchy in spatial distribution. While this is normal in natural systems, to some extent this patchy distribution was based not on the natural distribution of the species, but on the limitations of the sampling protocols. Once the proposed designations were completed, including whatever additional information was available (ELMR, inshore surveys, fishing industry, landings, historical, etc.), the Council chose to also include any empty ten minute squares surrounded by either seven or eight "filled in" ten minute squares. This approach "smoothes" the designations, reducing to some degree the patchy nature of the EFH designations. For instance, there appeared certain areas where quite large expanses of EFH surrounded a single empty ten minute square. This may have resulted from the ten minute square not being sampled enough to be included in the analysis, or may have resulted from some topographic feature that prevented the survey gear from operating efficiently. Including these areas in the EFH designations assumes that they are important to the species. No ten minute squares were eliminated from the EFH designations in this process.

3.2.4 Areas Not Designated EFH

Certain geographic regions were not represented in the data considered by the Council, such as near shore waters of Maine, eastern Long Island, and smaller estuaries. These areas, therefore, have not been considered in the EFH designation process. This does not mean that they are not potentially important, but rather they represent data and information gaps. There is a need for information on the relative abundance of managed species in all areas that are not surveyed systematically. As information becomes available on these areas, the Council will consider including them in the EFH designations of the appropriate species. The Council will also consider whether certain near shore areas that represent data gaps should be designated EFH based on identified EFH in adjacent or nearby areas that share similar environmental characteristics.

3.3 HABITAT AREAS OF PARTICULAR CONCERN

According to the language of the Interim Final Rule, EFH that is judged to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation, should be identified as "habitat areas of particular concern" (HAPC) to help provide additional focus for conservation efforts. The following provisions of the Interim Final Rule provide guidance for habitat areas of particular concern:

> (6) (ii) Cumulative impacts from fishing. In addressing the impacts of fishing on EFH, Councils should also consider the cumulative impacts of multiple fishing practices and non-fishing activities on EFH, especially, on habitat areas of particular concern. Habitats that are particularly vulnerable to specific fishing equipment types should be identified for possible designation as habitat areas of particular concern.
>
> (9) Identification of habitat areas of particular concern. FMPs should identify habitat areas of particular concern within EFH. In determining whether a type, or area of EFH is a habitat area of particular concern, one or more of the following criteria must be met:
>
> (i) The importance of the ecological function provided by the habitat.
> (ii) The extent to which the habitat is sensitive to human-induced environmental degradation.
> (iii) Whether, and to what extent, development activities are, or will be, stressing the habitat type.
> (iv) The rarity of the habitat type.

The intent of the habitat areas of particular concern designation is to identify those areas that are known to be important to species which are in need of additional levels of protection from adverse impacts. Management implications do result from their identification. Designation of habitat areas of particular concern is intended to determine

what areas within EFH should receive more of the Council's and NMFS' attention when providing comments on federal and state actions, and in establishing higher standards to protect and/or restore such habitat. Certain activities should not be located in areas identified as habitat areas of particular concern due to the risk to the habitat. Habitats that are at greater risk to impacts, either individual or cumulative, including impacts from fishing, may be appropriate for this classification. Habitats that are limited in nature or those that provide critical refugia (such as sanctuaries or preserves) may also be appropriate. General concurrences may be granted for activities within habitat areas of particular concern; however, greater scrutiny is necessary prior to approval of the general concurrence.

Following a review of the scientific literature for information on areas deserving special attention or species with particular habitat associations, the Council has designated an area on Georges Bank as an HAPC for juvenile Atlantic cod (Figure 6). Considering the unique habitat associations and requirements of Atlantic salmon, the Council has designated the habitat of eleven rivers in Maine as HAPCs for Atlantic salmon (Figure 7). The Council may consider designating additional habitat areas of particular concern in the future. Additional designations may be based on existing or developing knowledge of species-habitat associations, the unique characteristics of a particular habitat type, the threats to sensitive habitats, or the importance of an area to multiple species.

3.3.1 Atlantic cod HAPC

Several sources document the importance of gravel/cobble substrate to the survival of newly settled juvenile cod (Lough *et al.* 1989; Valentine and Lough 1991; Gotceitas and Brown 1993; Tupper and Boutilier 1995; Valentine and Schmuck 1995). A substrate of gravel or cobble 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). Particular life history stages or transitions are sometimes considered "ecological bottlenecks" if there are extremely high levels of mortality associated with the life history stage or transition. Extremely high mortality rates attendant to post-settlement juvenile cod are attributed to high levels of predation (Tupper and Boutilier 1995). Increasing the availability of suitable habitat for post-settlement juvenile cod could ease the bottleneck, increasing juvenile survivorship and recruitment into the fishery. For these reasons, areas with a gravel/cobble substrate meet the first criterion for habitat areas of particular concern.

Specific areas on the northern edge of Georges Bank have been extensively studied and identified as important areas for the survival of juvenile cod (Lough *et al.* 1989; Valentine and Lough 1991; Valentine and Schmuck 1995). These studies provide reliable information on the location of the areas most important to juvenile cod and the type of substrate found in those areas. These areas have also been studied to determine the effects of bottom fishing on the benthic megafauna (Collie *et al.* 1996; Collie *et al.* 1997). Gravel/cobble substrates not subject to fishing pressure support thick colonies of emergent epifauna, but bottom fishing, especially scallop dredging, reduces habitat complexity and removes much of the emergent epifauna (Collie *et al.* 1996; Collie *et al.* 1997). Acknowledging that a single tow of a dredge across pristine habitat will have few

long-term effects, Collie *et al.* (1997) focus on the cumulative effects and intensity of trawling and dredging as responsible for potential long-term changes in benthic communities. For these reasons, the identified area on the northern edge of Georges Bank meets the second criterion, as well as the cumulative effects consideration, for designation as a habitat area of particular concern.

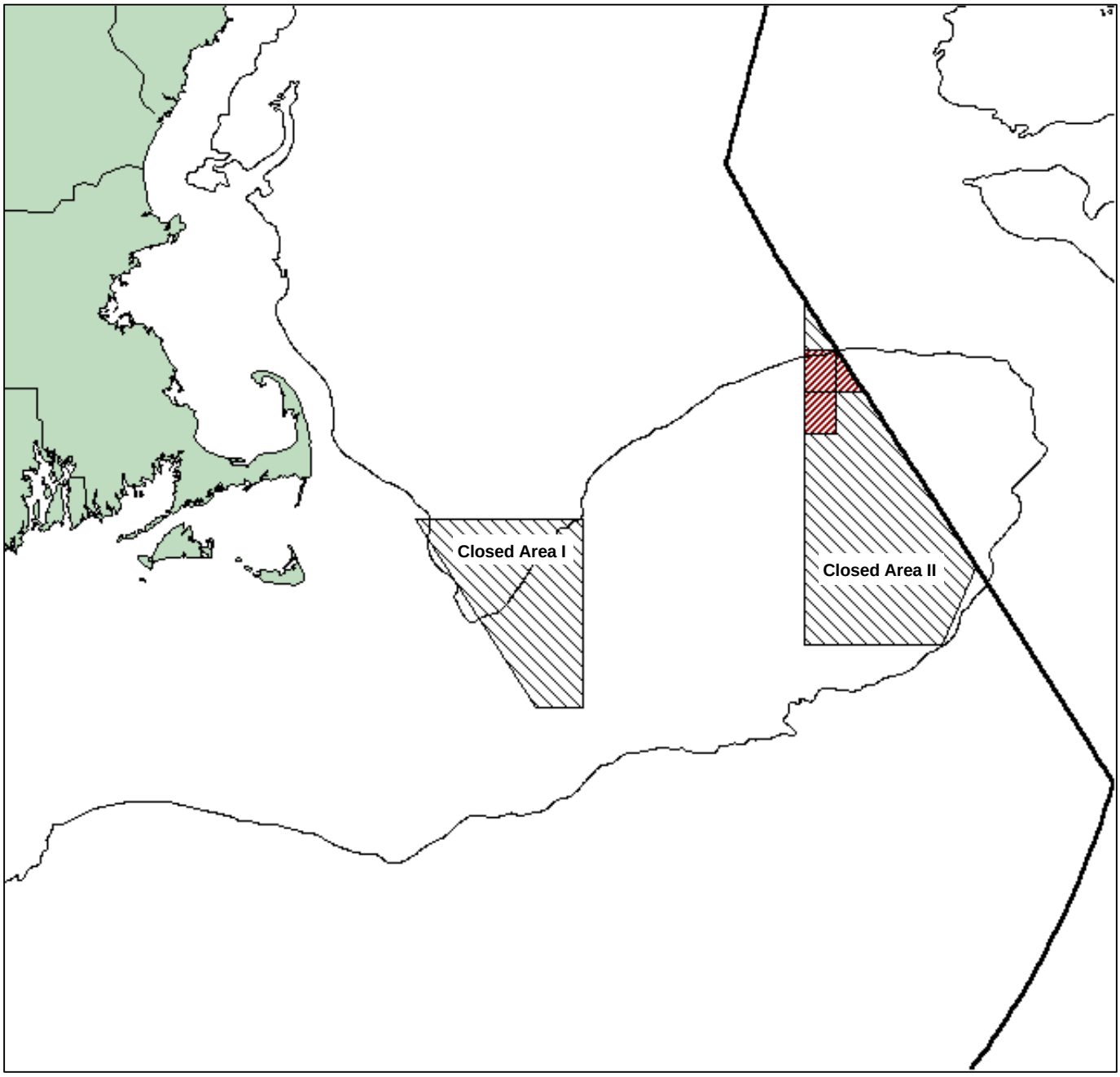
Collie *et al.* (1997) also describe the relative abundance of several other species such as shrimps, polychaetes, brittle stars, and mussels in the undisturbed sites. These species are found in association with the emergent epifauna (bryozoans, hydroids, worm tubes) prevalent in the undisturbed areas. 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; NEFSC 1998). These areas provide two important ecological functions for post-settlement juvenile cod relative to other areas: increased survivability and readily available prey. These areas are also particularly vulnerable to adverse impacts from mobile fishing gear.

3.3.2 Atlantic salmon HAPC

Seven small, coastal drainages located in the Downeast and midcoast sections of Maine hold the last remaining populations of native Atlantic salmon in the United States (MASA and USFWS 1996). These important rivers are the Dennys, Machias, East Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot. The U.S. Fish and Wildlife Service (USFWS) and NMFS have determined that these rivers represent one distinct population segment (DPS). A DPS is defined as a population of vertebrates that is discrete and ecologically significant. Four other rivers in Maine -- the Kennebec, Penobscot, St. Croix, and Tunk Stream -- are being considered for possible inclusion in the DPS.

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. Unfortunately the habitat of these rivers is susceptible to a variety of human-induced threats, 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 also the genetic integrity of the native populations contained in the rivers. The habitat of these rivers serves two very important purposes in terms of being habitat areas of particular concern: (1) they provide a unique and important ecological function; and, (2) they are sensitive to human-induced environmental degradation. Accordingly, the rivers meet at least two criteria for designation as habitat areas of particular concern.

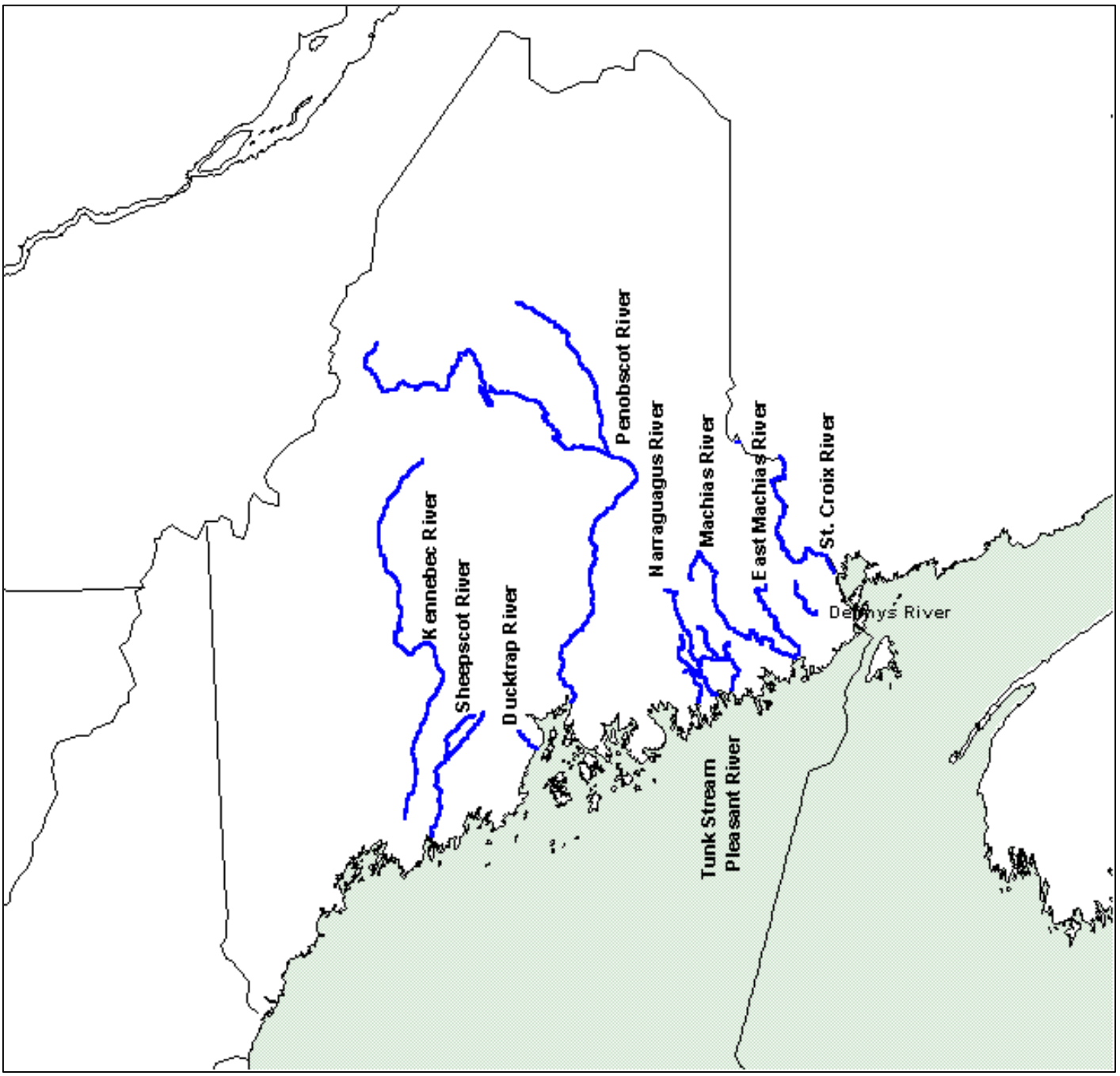
Figure 6: Habitat Area of Particular Concern for Juvenile Atlantic Cod



The shaded areas represent Closed Areas I and II, as indicated.

The darkened area within Closed Area II represents the Habitat Area of Particular Concern for juvenile Atlantic cod.

Figure 7: Habitat Areas of Particular Concern for Atlantic Salmon



These eleven rivers in Maine have been designated as "habitat areas of particular concern" for Atlantic salmon, based on the importance of the habitat of these rivers in supporting unique and important populations of Atlantic salmon in the United States.

3.4 EFH TEXT DESCRIPTIONS AND MAP DESIGNATIONS

For each species currently managed by the Council this section includes a one-page text description of the essential fish habitat for each life history stage, a table identifying those bays and estuaries included in the EFH designation (based on information provided in NOAA's ELMR reports), and a series of maps representing the Council's EFH designations for each life history stage. The EFH maps reflect all information included in the Council's designations, including the ELMR bays and estuaries, other inshore data, the historic range of the species, areas identified by the fishing industry, and those ten minute squares filled in to "smooth" the designations. The captions accompanying maps for the EFH designations describe the information reflected in those designations and provide the Council's rationale for selecting the preferred alternatives. The sets of maps representing the alternative designations from which the Council chose are provided in Section 12.2.3 of the Environmental Assessment. The sets of maps for the other alternatives include only the "raw" distributions as reflected in the NMFS bottom trawl and MARMAP surveys.