Essential Fish Habitat Description
Atlantic cod (*Gadus morhua*)

In its *Report to Congress: Status of the Fisheries of the United States* (September 1997), NMFS determined the Gulf of Maine stock of cod is considered overfished, based on the fishing mortality rate. The Georges Bank stock of cod is not considered overfished, also based on the fishing mortality rate associated with this stock. For both stocks of cod, essential fish habitat is described as those areas of the coastal and offshore waters (out to the offshore U.S. boundary of the exclusive economic zone) that are designated on Figures 1.1 - 1.4 and in the accompanying table and meet the following conditions:

Eggs: Surface waters around the perimeter of the Gulf of Maine, Georges Bank, and the eastern portion of the continental shelf off southern New England as depicted in Figure 1.1. Generally, the following conditions exist where cod eggs are found: sea surface temperatures below 12° C, water depths less than 110 meters, and a salinity range from 32 - 33‰. Cod eggs are most often observed beginning in the fall, with peaks in the winter and spring.

Larvae: Pelagic waters of the Gulf of Maine, Georges Bank, and the eastern portion of the continental shelf off southern New England as depicted in Figure 1.2. Generally, the following conditions exist where cod larvae are found: sea surface temperatures below 10° C, waters depths from 30 - 70 meters, and a salinity range from 32 - 33‰. Cod larvae are most often observed in the spring.

Juveniles: Bottom habitats with a substrate of cobble or gravel in the Gulf of Maine, Georges Bank, and the eastern portion of the continental shelf off southern New England as depicted in Figure 1.3. Generally, the following conditions exist where cod juveniles are found: water temperatures below 20° C, depths from 25 - 75 meters, and a salinity range from 30 - 35‰.

Adults: Bottom habitats with a substrate of rocks, pebbles, or gravel in the Gulf of Maine, Georges Bank, southern New England, and the middle Atlantic south to Delaware Bay as depicted in Figure 1.4. Generally, the following conditions exist where cod adults are found: water temperatures below 10° C, depths from 10 - 150 meters, and a wide range of oceanic salinities.

Spawning Adults: Bottom habitats with a substrate of smooth sand, rocks, pebbles, or gravel in the Gulf of Maine, Georges Bank, southern New England, and the middle Atlantic south to Delaware Bay as depicted in Figure 1.4. Generally, the following conditions exist where spawning cod adults are found: water temperatures below 10° C, depths from 10 - 150 meters, and a wide range of oceanic salinities. Cod are most often observed spawning during fall, winter, and early spring.

All of the above EFH descriptions include those bays and estuaries listed on the following table, according to life history stage. The Council acknowledges potential seasonal and spatial variability of the conditions generally associated with this species.

EFH Designation of Estuaries and Embayments
Atlantic cod (*Gadus morhua*)

Estuaries and Embayments	Eggs	Larvae	Juvenile	Adult	Spawning Adults
Passamaquoddy Bay		S	S	S	
Englishman/Machias Bay	S	S	S	S	S
Narraguagus Bay	S	S	S	S	S
Blue Hill Bay	S	S	S	S	S
Penobscot Bay		S	S	S	
Muscongus Bay			S	S	
Damariscotta River			S	S	
Sheepscot River	S	S	S	S	S
Kennebec / Androscoggin Rivers			S	S	
Casco Bay	S	S	S	S	
Saco Bay	S	S	S	S	
Wells Harbor					
Great Bay	S	S			
Merrimack River					
Massachusetts Bay	S	S	S	S	S
Boston Harbor	S	S	m,s	m,s	S
Cape Cod Bay	S	S	S	S	S
Waquoit Bay					
Buzzards Bay	S	S	S	S	
Narragansett Bay					
Long Island Sound					
Connecticut River					
Gardiners Bay					
Great South Bay					
Hudson River / Raritan Bay					
Barnegat Bay					
Delaware Bay					
Chincoteague Bay					
Chesapeake Bay					

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‰).

F ≡ The EFH designation for this species includes the tidal freshwater salinity zone of this bay or estuary (0.0 < salinity < 0.5‰).

These EFH designations of estuaries and embayments are based on the NOAA Estuarine Living Marine Resources (ELMR) program (Jury *et al.* 1994; Stone *et al.* 1994). For a detailed view of the salinity zone boundaries, as described in the ELMR reports, please see Appendix B. The Council recognizes the spatial and temporal variability of estuarine and embayment environmental conditions generally associated with this species.

Essential Fish Habitat
Atlantic cod (*Gadus morhua*) Eggs

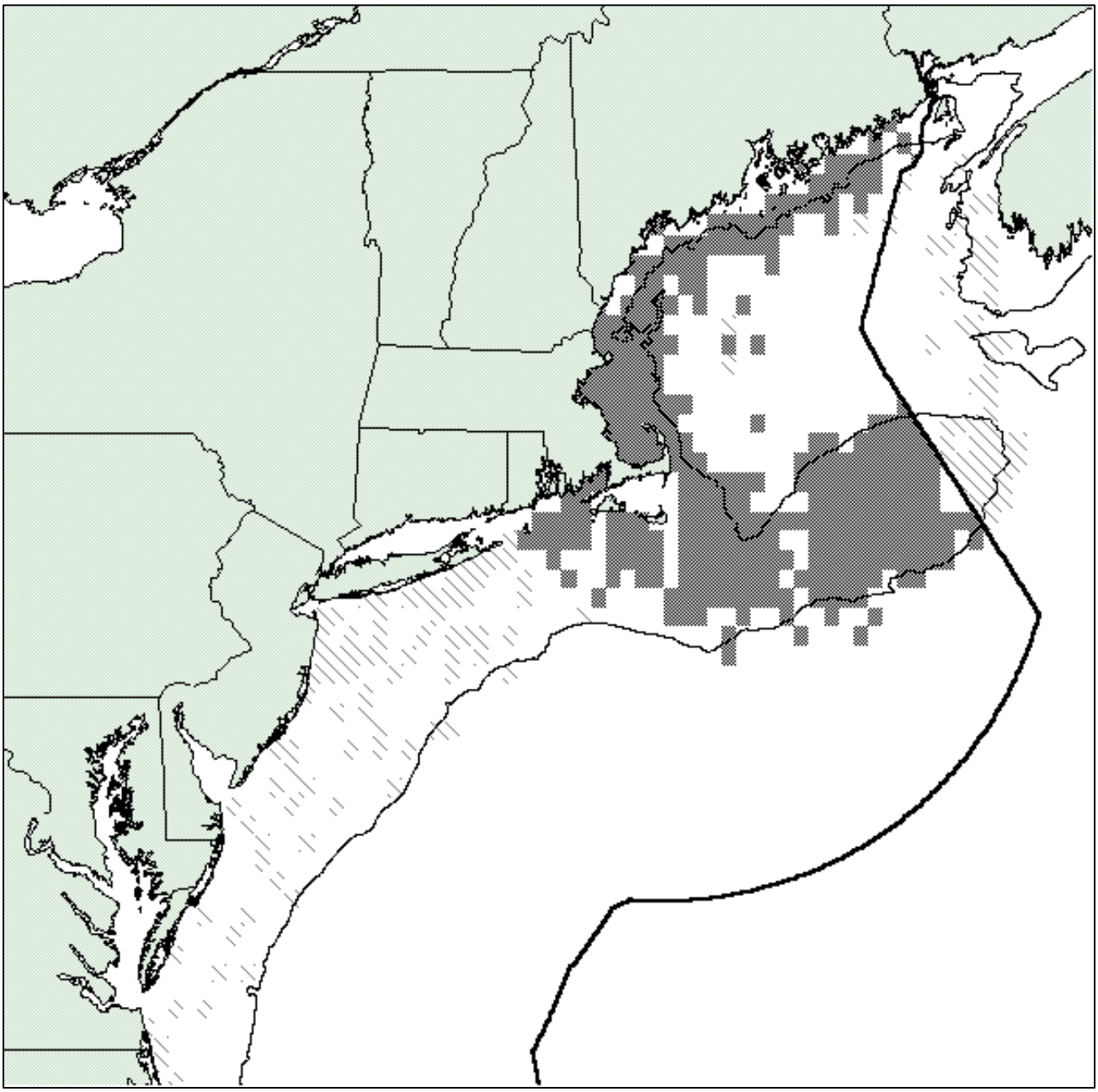

Figure 1.1: The EFH designation for Atlantic cod eggs is based upon a combination of alternative 3 for juvenile Atlantic cod plus alternative 3 for Atlantic cod eggs within the range of juvenile cod. This designation also includes those bays and estuaries identified by the NOAA ELMR program as supporting Atlantic cod eggs at a "common" or "abundant" level. This approach was selected because the data on the distribution of cod eggs include areas believed to be not conducive to their survival. Eggs that occur south of Long Island are either passively transported southward by currents or spawned by fish on the southern edge of the range and the environmental conditions in this area are believed to be not suitable for survival. The component of the adult cod population in this area is migratory in nature; thus, these eggs do not contribute to this population. The light shading represents the entire observed range of Atlantic cod eggs.

Essential Fish Habitat
Atlantic cod (*Gadus morhua*) Larvae

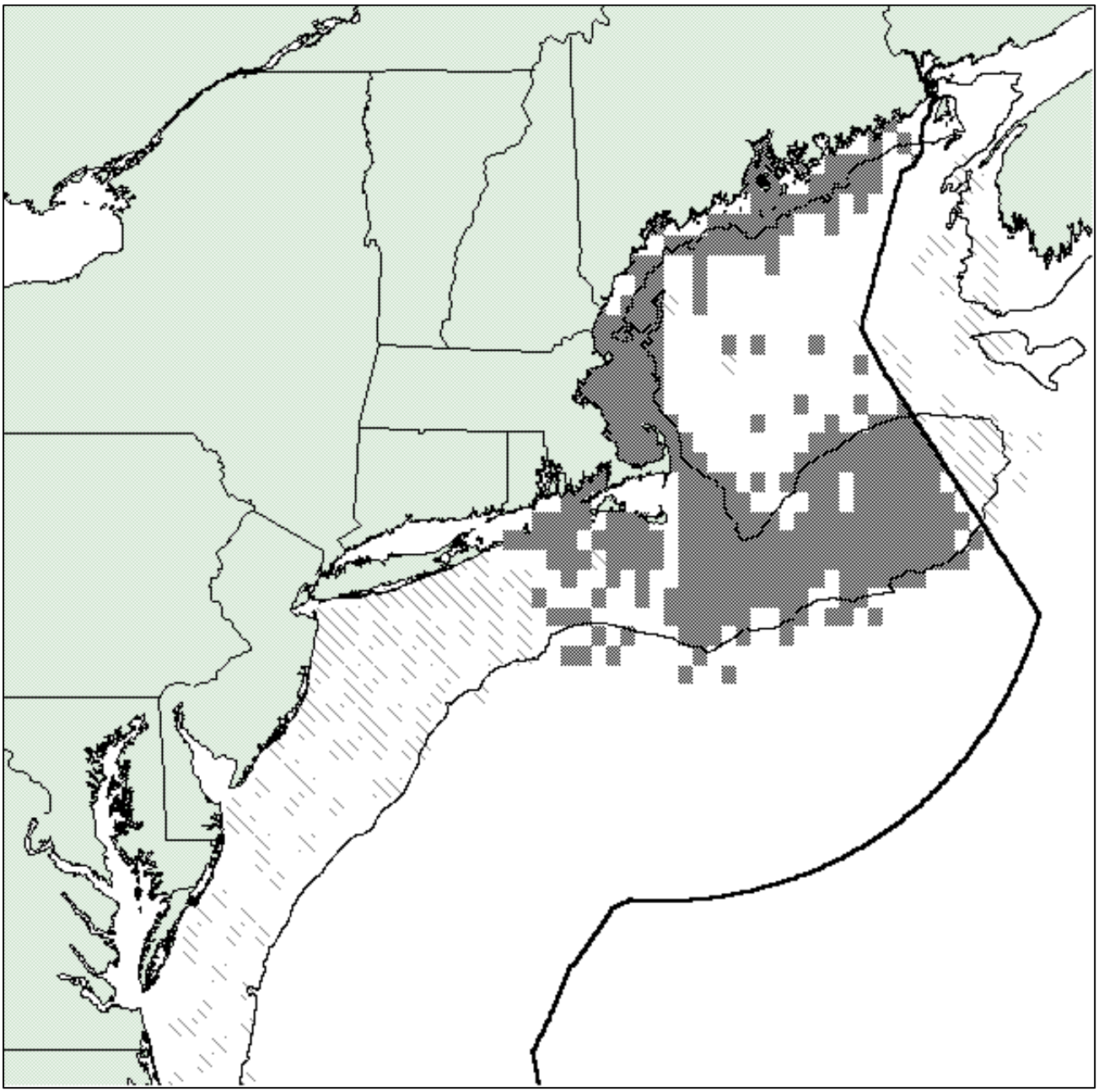

Figure 1.2: The EFH designation for Atlantic cod larvae is based upon a combination of alternative 3 for juvenile Atlantic cod plus alternative 3 for Atlantic cod larvae within the range of juvenile cod. This designation also includes those bays and estuaries identified by the NOAA ELMR program as supporting Atlantic cod larvae at a "common" or "abundant" level. This approach was selected because the data on the distribution of cod larvae include areas believed to be not conducive to their survival. Eggs and larvae that occur south of Long Island are either passively transported southward by currents or spawned by fish on the southern edge of the range and the environmental conditions in this area are believed to be not suitable for survival. The component of the adult cod population in this area is migratory in nature; thus, these larvae do not contribute to this population. The light shading represents the entire observed range of Atlantic cod larvae.

Essential Fish Habitat
Atlantic cod (*Gadus morhua*) Juveniles

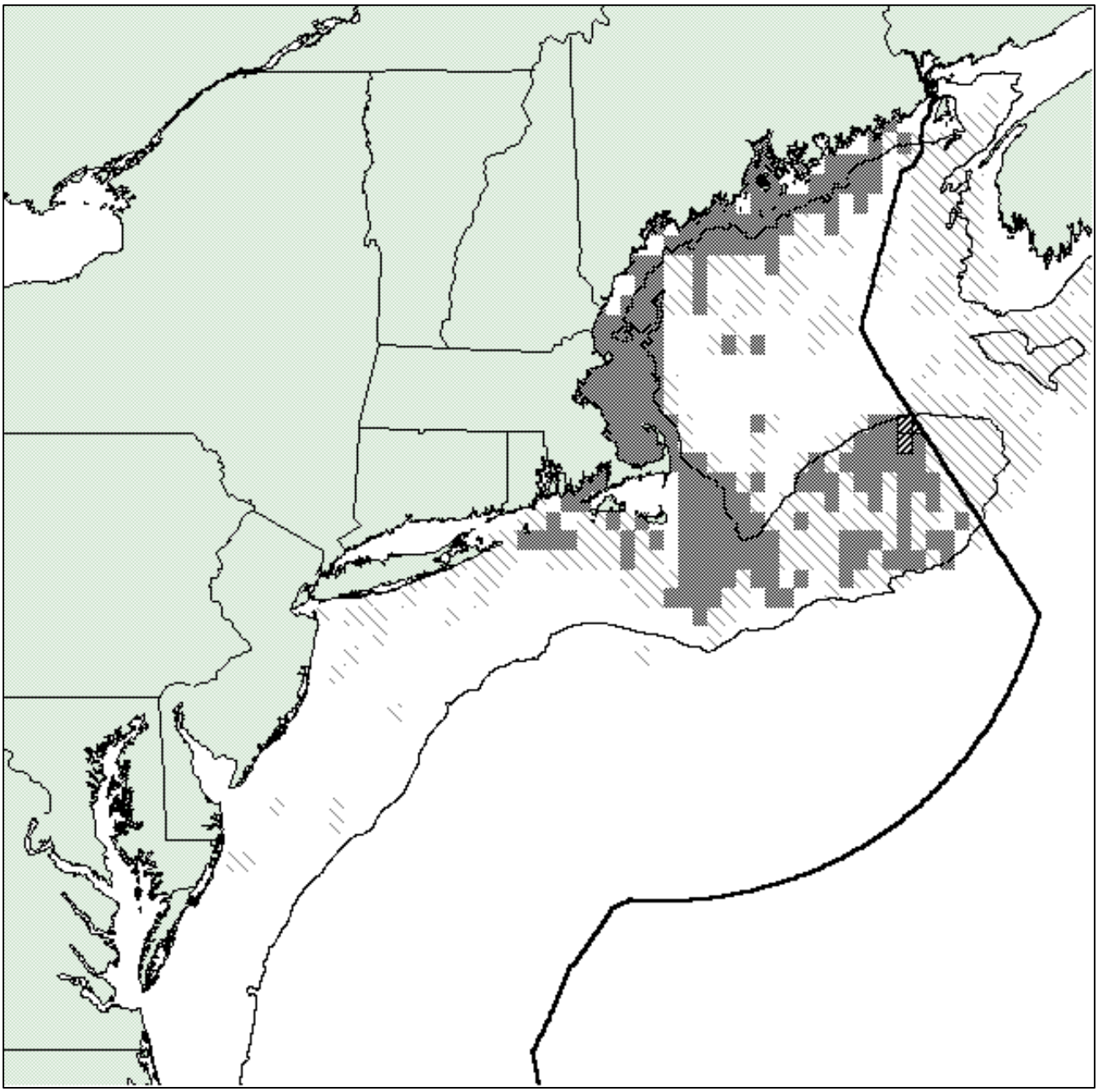

Figure 1.3: The EFH designation for juvenile Atlantic cod is based upon alternative 3 for cod juveniles plus information from the fishing industry. This designation also includes those bays and estuaries identified by the NOAA ELMR program as supporting juvenile Atlantic cod at a "common" or "abundant" level and information from the Massachusetts Inshore Trawl Survey. The other alternatives were not selected because they either include too little area (less than half the range of this overfished species), or include areas where cod occur in relatively low concentrations. The small area highlighted on the northern edge of Georges Bank represents the "habitat area of particular concern" designation for juvenile Atlantic cod (see Section 3.3.1). The light shading represents the entire observed range of Atlantic cod juveniles.

Essential Fish Habitat
Atlantic cod (*Gadus morhua*) Adults

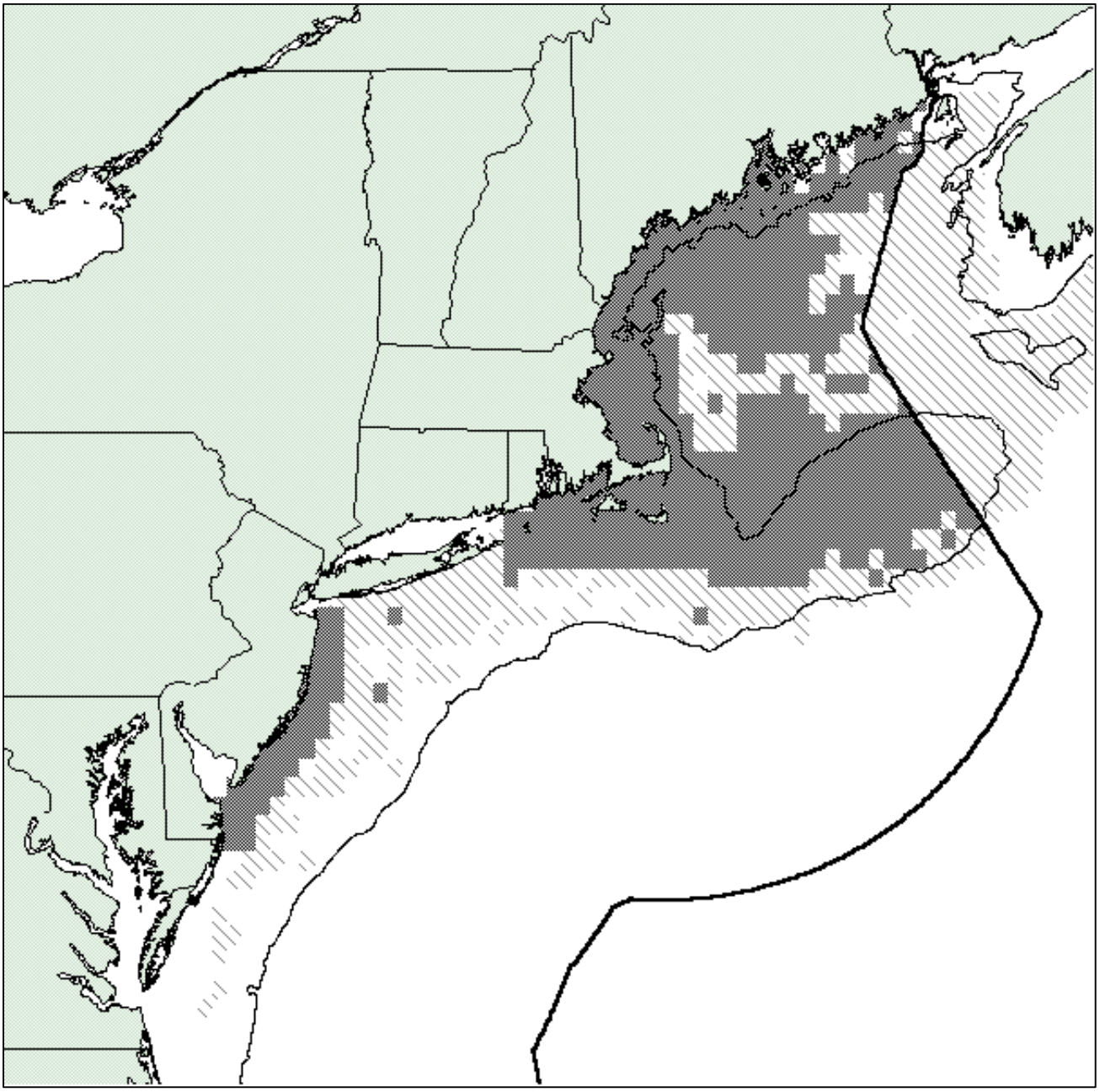

Figure 1.4: The EFH designation for adult Atlantic cod is based upon alternative 3 for cod adults plus areas identified as important spawning grounds and information from the fishing industry. This designation also includes those bays and estuaries identified by the NOAA ELMR program as supporting adult Atlantic cod at a "common" or "abundant" level. The shaded areas south of Massachusetts and Rhode Island and along the coast of New Jersey and Delaware were selected for EFH designation based on their historical importance for a portion of the adult population that migrates to this area for feeding in the winter. The other alternatives were not selected because they either include too little area (less than half the range of this overfished species), or include areas where cod occur in relatively low concentrations. The light shading represents the entire observed range of Atlantic cod adults.