Draft for Board Review
Atlantic States Marine Fisheries Commission

Amendment 3 to the Interstate Fishery Management Plan for Atlantic Herring

Revised January 27, 2016

(A number of changes have been made to this document since its first release on January 21st. All text changes have been highlighted in yellow, with the exception of Section 1.2.2 (stock assessment summary) which has been fully revised.)

ASMFC Vision: Sustainably Managing Atlantic Coastal Fisheries

Amendment 3 to the Interstate Fishery Management Plan for Atlantic Herring

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DRAFT FOR BOARD REVIEW

Executive Summary

The executive summary highlights the sections that contain a management decision. Specific sections include 4.2.6 Spawning Restrictions, 4.2.7 Fixed Gear Fisheries, and 4.2.8 Empty Fish Hold Provision.

Commission's Process and Timeline

February 2014	Atlantic Herring Section Initiates Plan Amendment and Tasks PDT to Develop Public Information Document (PID)
May 2014	Atlantic Herring Section Approves Draft PID for Public Comment
Summer 2014	Section Solicits Public Comment on the PID and States Conduct Public Hearings
August 2014	Atlantic Herring Section Tasks Plan Development Team to develop draft Amendment 3
November 2015	Atlantic Herring Section Approves Draft Amendment 3 Public Hearing Document for Public Comment
December 2015-January 2016	Section Solicits Public Comment on Draft Amendment 3 Public Hearing Document and States Conduct Public Hearings
February 2016	**Atlantic Herring Section Selects Management Options; Commission Approves Amendment 3 to the FMP**

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1.0 INTRODUCTION

The Atlantic States Marine Fisheries Commission (ASMFC) is responsible for managing Atlantic Herring (*Clupea harengus*), under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (ACFMA). The U.S. Atlantic herring fishery is currently managed as a single stock through complementary Fishery Management Plans (FMPs) by ASMFC and the New England Fishery Management Council (NEFMC). ASMFC has coordinated interstate management of Atlantic herring in state waters (0-3 miles) since 1993. Management authority in the exclusive economic zone (EEZ, 3-200 miles from shore) lies with the NEFMC and NOAA Fisheries.

1.1 STATEMENT OF THE PROBLEM

The Commission initiated Draft Amendment 3 to propose management measures which reflect changes in the stock structure, integrate recent data into management decisions, and respond to changes in the fishery.

Spawning Area Efficacy
While Atlantic herring reproduce in the same general season each year, the onset, peak and duration of spawning may vary by several weeks annually because of changing oceanographic conditions (e.g., sea temperature, plankton availability). In an effort to protect the integrity of the spawning stock and allow for the potential of increased recruitment, the ASMFC developed a system of seasonal spawning closures that accounted for this annual variability in spawning time. At the time of development, in the early 1990s, the available data to derive the spawning closure system was limited.

The Technical Committee has since analyzed over a decade of data to improve upon the current spawning closure system. Analysis indicates the current population of herring is quite different today, as the stock has rebuilt since the early 1990s. There is a broader range of age classes with older and larger fish when compared to the stock during overfished conditions. Given a broad range of age classes, fish arrive at the spawning grounds at different times (e.g., larger fish can swim faster and arrive earlier than smaller fish).

There are concerns the timing of spawning closures do not adequately protect spawning fish in the areas they spawn. Samples are collected from the commercial fishery, which is dependent upon interactions with spawning fish. However, it is not always possible to collect sufficient data to inform the start of the spawning closure. In addition, samples from Maine and Massachusetts are analyzed separately, and sometimes contain too few fish to confidently characterize spawning stages.

Fixed Gear Set-Aside Provision
Draft Amendment 3 also includes options to remove the fixed gear set-aside provision. Currently, the set-aside of 295 metric tons (mt) is available to fixed gear fishermen up to November 1, after which the remaining set-aside becomes available to the rest of the Area 1A fishery. November 1 was initially set because, traditionally, herring have migrated out of the

Gulf of Maine by that time of the year. Anecdotal evidence suggest herring are in the Gulf of Maine after November 1, therefore fixed gear fishermen requested the set-aside be available to them through the entire calendar year (January 1 through December 31).

Empty Fish Hold Provision
Lastly, Draft Amendment 3 considers a requirement for fish holds to be empty of fish prior to trip departures. Concerns have been raised that unsold herring are dumped at sea if there is not enough market demand for the resource. Additionally, fish from multiple trips can be mixed if the holds are not completely emptied—this has the potential to compromise landings data used to inform harvest control measures and bycatch avoidance programs, particularly for river herring. Furthermore, leaving fish in the vessel's hold prevents portside samplers from observing the entire catch. Options are proposed to encourage less wasteful fishing practices by creating an incentive to catch amounts of herring as demanded by markets. NEFMC included a complementary empty fish hold provision in its Framework Adjustment 4 to the Federal Atlantic Herring FMP.

1.1.2 Benefits of Implementation

This amendment proposes to enhance spawning protections for Atlantic herring in the Gulf of Maine and create an incentive for better managed fishing practices to reduce impacts to species which are ecologically associated with Atlantic herring while minimizing adverse effects on participants in the fishery.

1.1.2.1 Social and Economic Benefits

The goal of the Atlantic herring fishery management plan is to enhance spawning protections for Atlantic herring, incentivize sustainable fishing practices, and improve accountability measures for directed catch and incidental bycatch of river herring. Adequate protections of the reproductive stock of Atlantic herring is intended to result in better recruitment during favorable environmental conditions. Spawning closures therefore help ensure a stable fishery over time and in turn provides a measure of security to individuals and communities dependent on the resource. Presumably, the outcomes will be continued availability and accessibility to the fish, and better quality and prices. The empty fish hold provision proposes to incentivize market-appropriate catches (better business planning) and make conditions aboard the vessel safer. For more information on socioeconomic impacts, see Section 1.5.2.

1.1.2.2 Ecological Benefits

Amendment 3 proposes to update the current spawning closure system based on decades of observed data and spawning behavior identified in the scientific literature. This would allow fisheries biologists in Maine and Massachusetts (where spawning analysis is conducted) to pool samples for monitoring and use the information to forecast the onset of spawning by year. Thereby addressing the inter-annual variability in spawning events as dictated by oceanographic conditions, such as sea temperature. A forecasting system would help alleviate timing concerns associated with the current method. The empty fish hold option creates an incentive to harvest more sustainably to meet market demands, thereby reducing the removal of fish that will not be

used (and discarded at sea). It also ensures better accounting of Atlantic herring catch as well as bycatch monitoring of river herring species by preventing double-counting of trips. For more information on biological and ecological impacts, see Section 1.5.1.

1.2 DESCRIPTION OF THE RESOURCE

Atlantic herring are distributed along the east coast of North America from Canada to North Carolina occupying major estuaries, coastal waters and offshore waters to the continental shelf. There are three recognized stocks in the Atlantic herring complex: 1) Southwest Nova Scotia-Bay of Fundy, 2) coastal waters of the Gulf of Maine, and 3) Georges Bank, including Nantucket Shoals. Due to inter-seasonal mixing, herring are assessed in the U.S. as a single coastal stock at this time.

Evidence for separate stocks are derived from separate larval distribution patterns (Iles and Sinclair, 1982), differences in spawning times and locations (Boyar et al., 1973; Haegele and Schweigert, 1985) and distinct biological characteristics, such as growth rates (Anthony and Waring, 1980), physical characteristics (Anthony, 1981; Safford, 1985) and the incidence of parasites (McGladdery and Burt, 1985). Attempts to further differentiate geographically isolated fall spawning stocks in eastern Canada and the northeast U.S. on the basis of genetic characteristics have been unsuccessful (Kornfield et al., 1982; Kornfield and Bogdanowicz, 1987; Safford and Brooke, 1992).

The most compelling evidence supporting the existence of separate stocks was the collapse of the large Georges Bank-Nantucket Shoals stock in the early 1970s after several years of heavy fishing by foreign fleets. This stock remained in a depressed state for approximately ten years, while the smaller Gulf of Maine stock continued to support a strong coastal fishery.

Major spawning areas are restricted to the northern region (Cape Cod to Newfoundland) of the Atlantic herring distribution. The Gulf of Maine-Georges Bank stock complex contains three major spawning areas: 1) Georges Bank, 2) Nantucket Shoals, 3) coast of Gulf of Maine.

Each major spawning area is composed of smaller, discrete spawning sites—some are as close as 10-15 miles of each other (e.g., Trinity Ledge and Lurcher Shoals off the southwest coast of Nova Scotia). Observations of year-to-year changes in the abundance of adults (and age-structure) on individual spawning sites, in response to fishing pressure, tends to support discrete

spawning aggregations (or sub-stocks) of herring (Stephenson, 1998). Thus, appropriate fishing levels may not be the same within the stock complex.

In recent years there has been increasing emphasis on preserving all aspects of biodiversity, including within species diversity. The biological rationale for preserving this diversity is that such variation allows adaptation to changing conditions. The economic rationale is that the decrease or elimination of population richness may lead to the loss of fisheries, such as those occurred during the mid-1970s when the Georges Bank-Nantucket Shoals herring stock collapsed (Overholtz et al., 2004).

1.2.1 Species Life History

1.2.1.1 Herring as a forage fish and predator

Throughout its life stages from egg to adult, Atlantic herring serve as: (1) a source of protein for a variety of marine wildlife in the North Atlantic, (2) competition for other plankton feeders, and (3) as predators of other species eggs. Herring eggs, deposited in unprotected thick mats on the sea floor, incubate for about 10 days. They are subject to predation by a variety of demersal fish species, including winter flounder, cod, haddock, and red hake. Egg predation that results in high mortality can be a driving force on herring population trends (Richardson, et. al, 2011).

Atlantic herring is an important prey species for a large number of piscivorous fish, elasmobranchs (sharks and skates), marine mammals and seabirds in the northeastern U.S. Unlike other pelagic fishes such as Atlantic mackerel, herring are smaller and vulnerable to predation over most, if not all, of their life (Overholtz et al., 2000). Juvenile herring, especially "brit" (age-1 juveniles) are preyed upon heavily due to their abundance and small size. According to the Northeast Fisheries Science Center's Food Habits Database (NEFSC 2012), the top 13 predators of Atlantic herring are:

Spiny dogfish (*Squalus acanthias)*
Winter skate (*Leucoraja ocellata)*
Thorny skate (*Amblyraja radiate)*
Silver hake (*Merluccius bilinearis)*
Atlantic cod (*Gadus morhua)*
Pollock (*Pollachius virens)*
White hake (*Urophycis tenuis)*
Red hake (*Urophycis chuss)*
Summer flounder (*Paralichthys dentatus)*
Bluefish (*Pomatomus saltatrix)*
Striped bass (*Morone saxatilis)*
Sea raven (*Hemitripterus americanus)*
Goosefish (*Lophius americanus)*

Although its primary diet is plankton, herring are also known to prey on cod eggs when zooplankton levels are low. Cod larvae, however, is not significantly affected by herring predation due to limited spatial overlap between the two species.

1.2.1.2 Age and Growth

In U.S. waters, Atlantic herring reach a maximum length of about 39 cm (15.6 inches) and an age of about 15-18 years (Anthony, 1972; NEFMC, 2005). Male and female herring grow at about the same rate and become sexually mature beginning at age-3, with most maturing by age-4 (NEFMC, 2005). Growth rates vary greatly from year-to-year, and to some extent from stock-to-stock, and appear to be influenced by many factors, including temperature, food availability and population size. Juvenile growth is rapid during the first year of life, with a marked slowing at the onset of maturity. Juveniles in coastal Maine waters reach 90-125 mm (3.5–5 inches) by

the end of their first year of life. There has been a marked reduction in size and weight-at-age of adult herring in U.S. waters of the northwest Atlantic beginning in the mid-1980s (Overholtz et al., 2004), a trend that appears to be related to increased population size and recovery of the Georges Bank spawning stock.

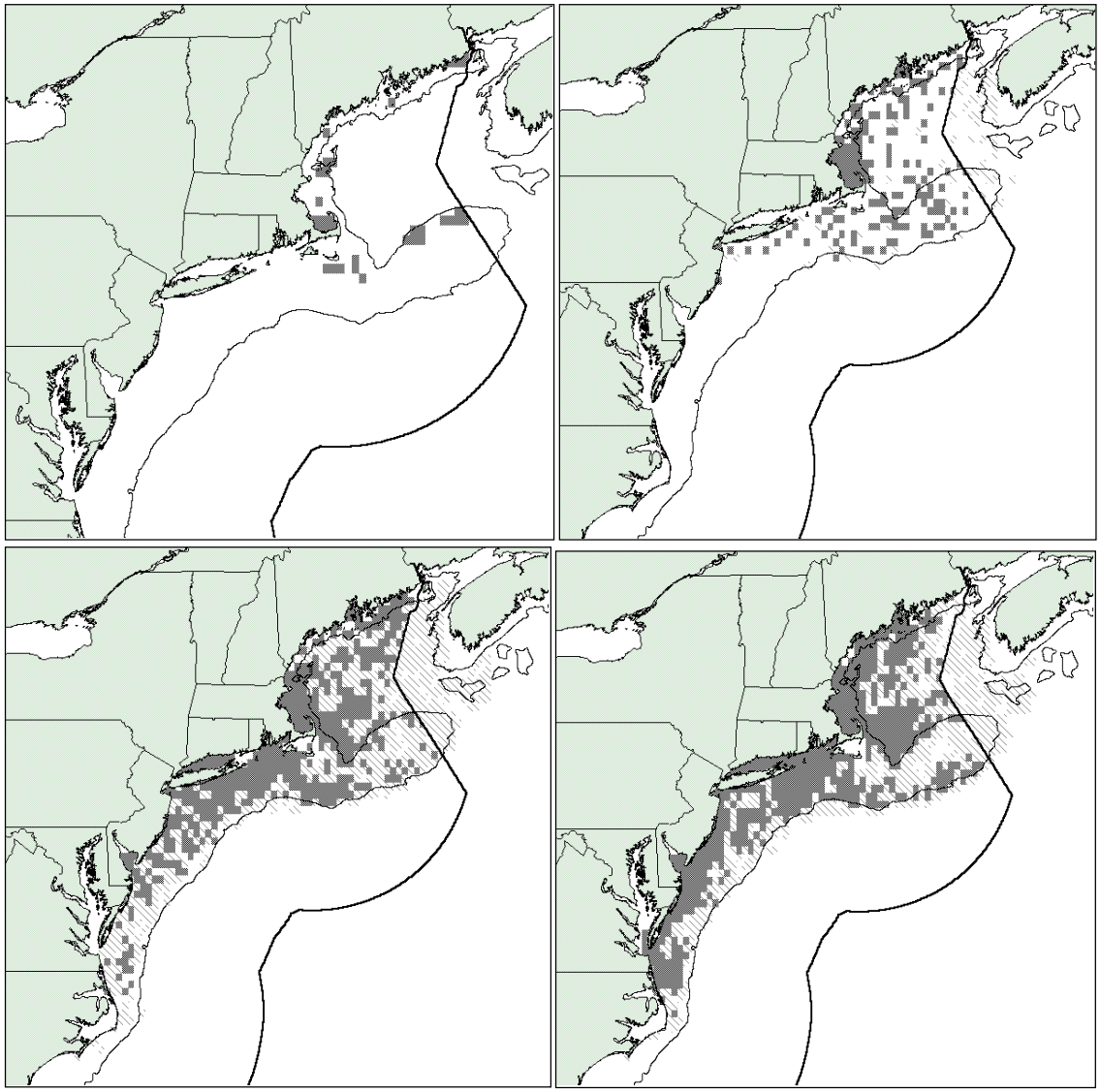
1.2.1.3 Spawning, Reproduction, and Early Life History

While Atlantic herring reproduce in the same general season each year, the onset, peak and duration of spawning may vary by several weeks annually (Winters and Wheeler, 1996) due to changing oceanographic conditions (e.g, temperature, plankton availability, etc.).

Atlantic herring are believed to return to natal spawning grounds throughout their lifetime to spawn (Ridgeway, 1975; Sinderman, 1979; NEFMC, 2005). This behavior is fundamental to the species' ability to maintain discrete spawning aggregations and is the basis for hypotheses concerning stock structure in the northwest Atlantic Ocean. Evidence for this homing behavior is provided by a tagging study in Newfoundland which showed a 73% return rate of adult Atlantic herring to the same spawning grounds where they were tagged (Wheeler and Winters, 1984) and by observations of year-to-year changes in the abundance and age composition of spawning aggregations on discrete banks and shoals off southwest Nova Scotia (Stephenson et al., 1998).

Spawning occurs in specific locations in the Gulf of Maine in depths of 20-50 meters (about 60-300 feet), on coastal banks such as Jeffreys Ledge and Stellwagen Bank located 8-40 km offshore, along the eastern Maine coast between the U.S.-Canada border and at various other locations along the western Gulf of Maine. Herring also spawn on Nantucket Shoals and Georges Bank, but not further south. In Canada, spawning occurs south of Grand Manan Island (in the entrance of the Bay of Fundy) and on various banks and shoals south of Nova Scotia (Figure 1). Spawning occurs in the summer and fall, starting earlier along the eastern Maine coast and southwest Nova Scotia (August-September) than in the southwestern Gulf of Maine (early to mid-October in the Jeffreys Ledge area and as late as November-December on Georges Bank) (Reid et al., 1999; NEFMC, 2005). Herring in the Gulf of Maine region usually reproduce at relatively high temperatures (10-15^{o} C) and at high salinities (NEFMC, 2005). Herring do not spawn in brackish water.

Figure 1. NEFMC EFH designation for Atlantic herring eggs (top left), larvae (top right), juveniles (bottom left), and adult (bottom right)

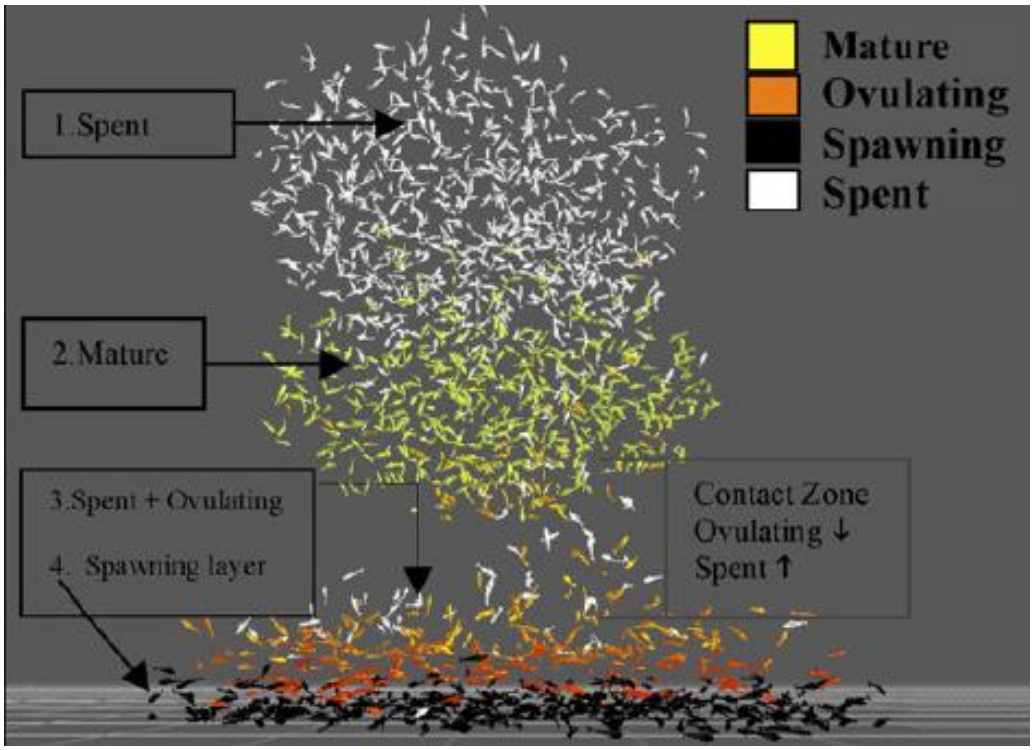


The eastern Maine-Grand Manan spawning ground is an important source of larvae, which are transported to the southwest along the Maine coast (Graham and Townsend, 1985; Townsend et al. 1986). The larvae overwinter in bays, estuaries and nearshore waters and become juveniles in the spring. Those juveniles that survive until the following spring and summer (age-2) are harvested as sardines in the coastal fishery. Larvae that hatch on Jeffreys Ledge, another important coastal spawning ground in the Gulf of Maine, are mostly transported shoreward (Cooper et al. 1975), although some overwinter in nearshore waters on the Maine coast (Lazzari and Stevenson 1991).

In some cases, the same spawning sites are used repeatedly, sometimes more than once a year (Stevenson 1989; NEFMC 2005). Jeffreys Ledge appears to be the most important spawning ground in the Gulf of Maine based on the number of spawning and near-spawning adults found there (Boyar et al. 1973).

Atlantic herring spawn on the bottom in discrete locations by depositing adhesive eggs that stick to any stable bottom substrate, including lobster pots and anchor lines. Eggs are laid in layers and form mats or carpets. In the Gulf of Maine region, egg mats as thick as 4-5 cm have been observed in discrete egg beds that have varied in size from 0.3-1.4 km^2. One very large egg bed surveyed on Georges Bank in 1964 covered an area of about 65 km^2 (Noskov and Zinkevich, 1967). Herring eggs in the Gulf of Maine region are deposited on gravel and rocky substrate, but are also found on sand, shells and shell fragments and occasionally on macroalgae (Figure 2). Spawning sites are located in areas with strong bottom currents (1.5-3 knots), which prevent the accumulation of fine sediment and provides circulation to supply oxygen and remove metabolites (Reid et al., 1999; NEFMC, 2005). Hatching success remains relatively high down to 20-25% dissolved oxygen (Aneer, 1987; NEFMC, 2005).

Figure 2. Vertical stratification by maturity stage within a school of spawning Atlantic herring (Vabo and Skaret, 2008)



Atlantic herring are synchronous spawners, producing eggs once a year after they reach maturity. Depending on their size and age, female herring can produce from 55,000 to 210,000 eggs (Kelly and Stevenson, 1983). Once they are laid on the bottom, herring eggs are preyed upon by a number of fish species, including cod, haddock, red hake, sand lance, winter flounder, smelt, tomcod, cunner, pollock, sculpins, skates, mackerel and even herring themselves (Munroe, 2002; NEFMC, 2005). Egg predation and adverse environmental conditions often result in high egg mortalities. Egg incubation periods are temperature dependent and range from 10-15 days in the

Gulf of Maine (Munroe, 2002; NEFMC, 2005). Hatching success is also temperature dependent; in experimental studies, all eggs held at 15° C hatched and none hatched at 0-5° C or at 20° C.

Larvae are about 4-10 mm (0.25 in) in length at hatching, which occurs 10-15 days after the eggs are deposited on the bottom (Fahay, 1983). The pelagic larval phase is relatively long in Atlantic herring, lasting 4-8 months in the Gulf of Maine, depending on the timing of spawning (Reid et al., 1999; NEFMC, 2005). Larvae are transported long distances from spawning grounds where they over-winter in coastal bays and estuaries. In the Gulf of Maine, the prevailing surface currents flow westward, transporting larvae that hatch in eastern Maine to the Sheepscot estuary in mid-coast Maine, a straight-line distance of about 150 km (Graham, 1982; Townsend, 1992). Boyar et al. (1973) reported that most of the recently hatched larvae from the southern end of Jeffreys Ledge are transported shoreward. Herring larvae from Nantucket Shoals and Georges Bank are widely dispersed and tend to drift to the southwest (Sindermann, 1979; Lough et al., 1980; Grimm, 1983; NEFMC, 2005). Metamorphosis occurs in the spring at a length of about 40 mm (1.5 in). Schooling behavior begins in the late larval and early juvenile, or "brit," stages. Young-of-the-year herring undergo a general offshore movement in the summer and fall and they are believed to spend the winter in deep coastal waters.

The persistence of discrete aggregations of larvae for several months after hatching over tidally mixed continental shelf spawning grounds in the Gulf of Maine and elsewhere, despite the presence of fairly strong longshore currents, has provided the basis for a larval "retention hypothesis" (Iles and Sinclair, 1982). This hypothesis states that Atlantic herring stock structure in an area like the Gulf of Maine is determined by larval distribution and retention patterns and that the maximum stock size in that area is determined by the number, location and extent of geographically stable retention areas. Such retention areas have been described off southwest Nova Scotia, around Grand Manan Island and on Georges Bank (Iles and Sinclair, 1982). In addition, they have been described in eastern Maine waters adjacent to Grand Manan (Chenoweth et al., 1989).

Mortality of Atlantic herring in the larval stage is very high since the larvae remain vulnerable to very low temperatures and a limited food supply for a prolonged period during winter, especially in shallow nearshore and estuarine waters (Townsend and Graham, 1981; Graham et al., 1991). Campbell and Graham (1991) developed an ecological model in order to examine which factors affected larval survival to the early juvenile stage. Some of the conclusions of that study were:

- Larval herring recruitment in Maine coastal waters is the result of a complex interaction of many processes, no one of which is truly dominant;
- Two year-old recruitment to the Maine herring fishery is established in the larval stage in some years and not until the brit stage in others;
- Larval food supply in autumn and winter, along with the quantity and distribution of spawning, are primary factors controlling herring recruitment to the brit stage for those years when the larval stage is critical;
- When larval survival is above a threshold, density-dependent predation on brit can reduce year-class size (the assumption being that the brit become the food of choice for opportunistic pelagic and demersal predators when brit exceed an abundance threshold);

- Temperature and longshore transport are secondary factors determining survival that may be most important through their interaction with primary factors;
- In most years, more larvae survive the winter in the coastal areas than in the estuaries and embayments; and
- The distribution of larvae along the Maine coast in springtime is largely a function of the variable movement of larvae.

1.2.1.4 Migration

Adult herring undertake extensive seasonal migrations between summer spawning grounds on Georges Bank and in the Gulf of Maine and overwintering areas in southern New England and the mid-Atlantic region. Stock mixing occurs during the winter and spring as fish migrate south. Thermal oceanic fronts between colder, less saline continental shelf water and warmer, more saline continental slope water provide an abundance of plankton and other food sources and greatly influence the migratory behavior of this species (Sindermann, 1979; Kelly and Moring, 1986; NEFMC, 2005).

There are distinct migratory patterns for each spawning stock off the northeast coast of the U.S.:

- The Nova Scotia stock spends the summer and fall months in southwest Nova Scotia and overwinters in Chedabucto Bay in northeastern Nova Scotia, but also mixes to some extent with the two southern stocks.
- The Georges Bank/Nantucket Shoals stock overwinters south of Cape Cod, can be found feeding in the Gulf of Maine in the spring and early summer and spawn southeast of Nantucket or on Georges Bank in the fall (Sindermann, 1979; Tupper et al., 1998; Munro, 2002; NEFMC, 2005;). After spawning, adults from Georges Bank move south again to overwinter with the oldest and largest fish migrating as far south as Chesapeake Bay.
- The migratory patterns of the coastal Gulf of Maine herring stock are not as well documented. It is believed that they may migrate southwest along the coast after spawning to overwinter south of Cape Cod, in Massachusetts Bay and other coastal areas of southern New England (Tupper et al., 1998; Reid et al., 1999; NEFMC, 2005). The waters off Cape Cod seem to constitute a mixing area for these stocks, where different groups pass at various times of the year (Sindermann, 1979; NEFMC, 2005).

Migration patterns of individual herring stocks are usually persistent year to year (Creaser and Libby, 1988; Reid et al., 1999; NEFMC, 2005). The spatial and temporal isolation of these different stocks occurs chiefly during spawning, with intermixing occurring during the non-spawning phases of migration (Sinclair and Iles, 1985; Reid et al., 1999; Munro, 2002; NEFMC, 2005). Adults from the two U.S. stocks mix during their winter migration to southern New England and mid-Atlantic waters and separate out onto their respective spawning grounds following a return northward migration in the spring. Adults that spawn off southwest Nova Scotia are not believed to mix to any significant degree with herring that spawn on Georges Bank or in the Gulf of Maine (Stephenson et al., 1998; NEFMC, 2005).

Juvenile herring in all stocks tend to remain in coastal areas throughout the year (Stewart and Arnold, 1994; NEFMC, 2005). Juveniles overwinter closer to the coast than adult herring, moving into the deeper waters of bays or offshore in the winter where they stay close to the

bottom (Reid et al., 1999; Overholtz, 2004; NEFMC, 2005). Smaller fish have greater temperature tolerances and juvenile Atlantic herring have been found to produce higher levels of antifreeze proteins than adults, adaptations that may allow them to withstand the colder coastal waters in the winter (NEFMC, 2005; Munro, 2002). Tagging studies have also indicated that juveniles migrate little during the summer (Waring, 1981; Stobo, 1983; Overholtz et al., 2004; NEFMC, 2005). Juveniles from several populations may mix in a given area (Stewart and Arnold, 1994) and aggregations of juvenile herring along the coast of Maine and New Brunswick are likely derived from a variety of spawning grounds (Overholtz et al., 2004; NEFMC, 2005).

1.2.1.5 Schooling

Despite the vast amount of literature available on the herring resource, there still exists a significant lack of knowledge about herring behavior and the impacts of fishing and various activities on fish behavior. There are several important characteristics about herring to acknowledge:

- Herring are obligate schoolers. They prefer to swim in large schools and cease to act as individual fish, but rather act as one unit in a large school.
- The sensory systems of herring are very well developed. The ability of herring to hear, see, and sense movement (through the lateral line) allows them to sense other fish in the area, school in the dark, and react to changes in water pressure. These factors also influence the way herring react to fishing gear.
- Herring have sensitivity to a wide frequency range and are most sensitive to sounds in the frequency region where fishing vessels (and research vessels) have the maximum sound energy output. Herring are very sensitive to noise and have been shown to make directed responses to approaching vessels. Results of some studies indicate that the fish can hear trawlers at distances up to 3 kilometers.
- The visual senses of herring allow the fish to see at very low light levels (10^{-5} lux). Herding responses are mainly visual, and visually elicited avoidance reactions have been observed.
- Herring exhibit distinct migratory patterns, both seasonally (large-scale) and diurnally (night/day, small-scale). Migration is also affected by food availability and other environmental conditions (temperature, salinity, predators).
- Herring have very good buoyancy control. They can gulp and release air to fill and void their swim bladders as needed. The fish can sink very quickly if necessary.

Pelagic fishes school for hydrodynamic reasons, for reproduction, migration and feeding and to aid in surviving predatory attack (Freon and Misund, 1999; NEFMC, 2005). Schooling is a natural state for pelagic fishes and given a stimulus, fish like herring will react and then return to this state. When confronted by danger such as a predator or mid-water trawl, pelagic fish will quickly decrease their interfish distance (packing density) and try to avoid the stimulus (Freon et al., 1992; NEFMC, 2005). This will result in contortion, compression and stretching of the school and may result in short-term distortion or dispersion of the fish (Freon et al., 1993; NEFMC, 2005). This avoidance behavior will cease, however, as soon as the fish are out the near field (proximity) of the trawl or predator (Freon and Misund, 1999; NEFMC, 2005).

The normal reaction of herring to a trawl or purse seine is to increase their swimming speed and dive downwards, thereby trying to avoid the gear. In a study of Finnish pair trawling, visual and acoustic observations suggest that herring displayed an avoidance reaction in 34% of 493 midwater trawl hauls where fish were near the trawl mouth (Suuronen et al., 1997; NEFMC, 2005). Fish were observed to swim rapidly downward when they were within 5 m of the trawl and then return to their previous depth as soon as the trawl had passed. Herring react to midwater trawl and purse seines in much the same manner that they react to predators by trying to avoid and then regroup.

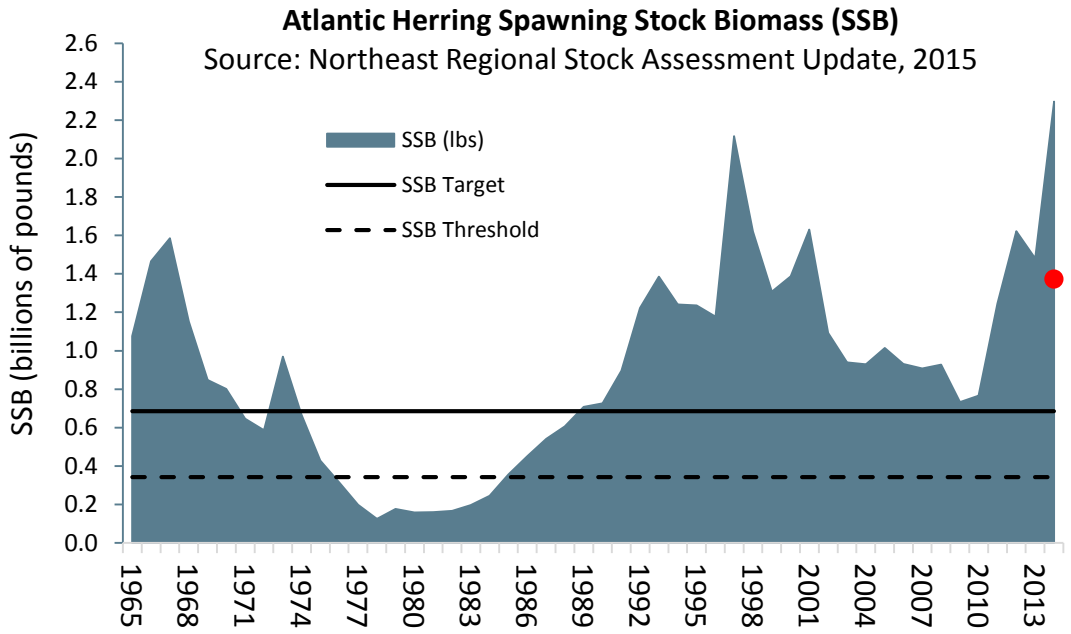
A study of the spatial dynamics of the Gulf of Maine/Georges Bank herring complex showed that herring maintained their school structure and interschool integrity in spite of very large reduction in overall biomass during the 1970s (Overholtz, 2004; NEFMC, 2005). Landings records from purse seine and midwater trawl vessels indicate that there were herring present in the Jeffreys Ledge region during all the months from April to October of 2001. Observations during herring acoustic cruises conducted by NMFS during 1997-2000 indicate nothing more than short-term disturbance of herring during midwater trawling and acoustic surveying operations. Fishing operations by at least a dozen large midwater trawlers conducted over a several month period during 2001 on Georges Bank caused no apparent changes in the distribution of pre-spawning herring as evidenced by hydroacoustic surveys conducted during September and October 2001 (NEFMC, 2005). There appears to be no scientific evidence either local or worldwide that midwater trawling or purse seining causes any long-term dispersal of herring.

1.2.2 Stock Assessment Summary

1.2.2.1. Abundance and Present Condition

The 2012 stock assessment resolved a persistent retrospective pattern; this pattern reappeared in the 2015 operational update and values were rho adjusted. The maximum sustainable yield (MSY) based reference points were also updated; the overfishing threshold is $F_{MSY} = 0.24$ and the overfished threshold is $½SSB_{MSY}$ = 342 million lbs (155,573 mt). The results of the 2015 stock assessment update indicate the stock is not experiencing overfishing and is not overfished (Deroba 2015).

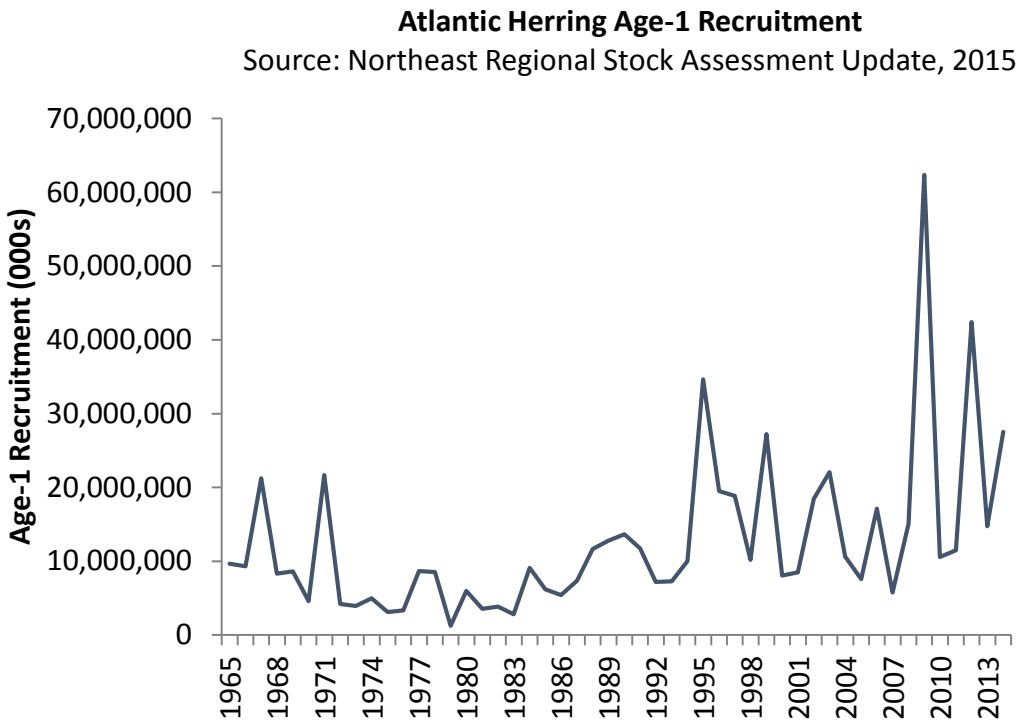
Figure 3. Atlantic Herring Spawning Stock Biomass. The red dot represents the 2014 retrospective adjusted value; retrospective adjustments are not applied to the entire time series.



1.2.2.2. Spawning Stock and Total Biomass

The point estimate of SSB in 1965 equaled 1 billion lbs (487,791 mt). SSB generally declined from 1965 to a time series low of 124 million lbs (56,509 mt) in 1978. SSB generally increased from 1978 through the mid-1990s. SSB declined from 1997 to 766.4 million lbs (347,675 mt) in 2010. The retrospective adjusted value for the 2014 SSB is 1.3 billion lbs (623,000 mt).

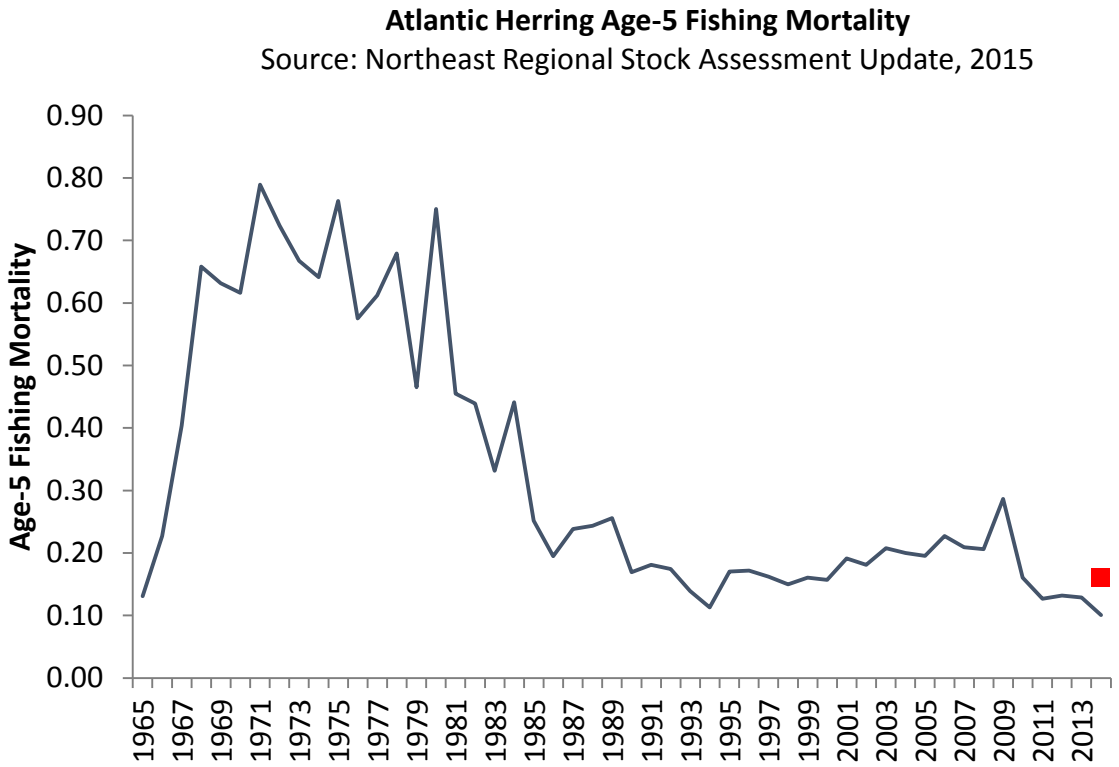
Figure 4. Atlantic Herring Age-1 Recruitment



1.2.2.3. Recruitment

Mean recruitment from 1965 to 2014 equaled 12.7 billion fish. The mean recruitment from 2000-2014 equaled 18.8 billion fish, largely due to several recent large year classes. The 2009 age-1 recruitment was the largest in the time series at 62.4 billion fish (Figure 4). The 2012 age-1 recruitment was estimated to be the second largest in the time series and equaled 42.4 billion fish.

Figure 5. Atlantic Herring Age-5 Fishing Morality. The red square represents the 2014 retrospective adjusted value; retrospective adjustments are not applied to the entire time series.



1.2.2.4. Fishing Mortality

Atlantic herring's fishing mortality (F) peaked in 1971 at a rate of 0.79. From 1971, F generally declined to a historic low of 0.13 in 1994. Since then, F has remained below the F_{MSY} threshold of 0.24, with a slight increasing trend until overfishing occurred in 2009 (F_{2009} = 0.32). Fishing mortality since 2009 has been relatively low because of the presence of strong cohorts that increased the stock biomass, and thus produce lower F given similar levels of catch. Fishing mortality (F) was estimated at 0.16 in 2014 after retrospective adjustment (Figure 5).

1.3 DESCRIPTION OF THE FISHERY

1.3.1 Commercial Fishery

The Atlantic herring resource occurs in waters off Canada and the United States, and fisheries exist in both countries. Based on the total catch (including discards) by the U.S. fixed and mobile gear, and Canada's New Brunswick weir fisheries, a majority of the fish are caught by the U.S. commercial fleet (time series average of 87%).

In the U.S., the Atlantic herring fishery is predominantly commercial; recreational catch accounts for less than 1% of the overall catch. Over the time series from 1950 to 2014 annual commercial catch by the U.S. Atlantic herring fleet was generally flat with a slightly declining

trend between 1950 through 1983, when it reached a historic low of 98.3 million lbs (44,613 mt). Annual catch averaged 244.4 million lbs (110,854 mt) from 1993, when FMP was implemented, through 2014. In 2014, catch totaled 210.1 million lbs (95,317 mt). Total catches from 2010-2014 ranged from 175.1 million lbs (79,413 mt) in 2010 to 224.0 million lbs (101,622 mt) in 2013 and averaged 198.5 million lbs (90,040 mt) (Figure 6). From 2004-2015, the sub-Annual Catch Limit (ACL) for Area 1A ranged from 58.5 million lbs (26,546 mt) to 132.3 million lbs (60,000 mt) (Table 1).

Figure 6. Atlantic Herring Total Catch (Source: ACCSP)

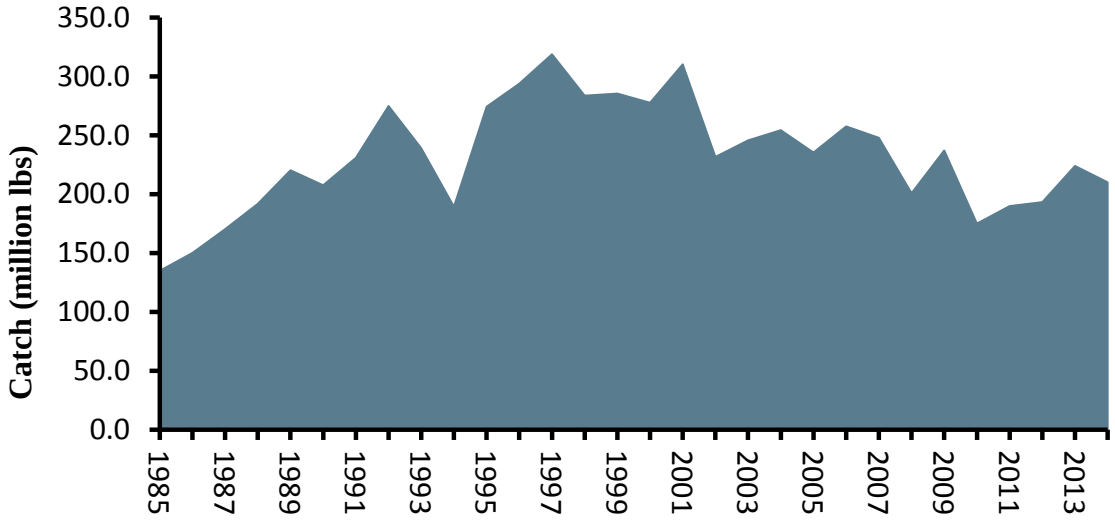


Table 1. Atlantic herring catch by year for Area 1A, 2004-2015 (Source: NMFS)

Year	Sub-ACL (lbs)**	Sub-ACL (MT)	Catch (lbs)**	Catch (MT)	% Utilized	Sub-ACL Closure
2004	132,276,000	60,000	132,485,437	60,095	100%	Nov-9
2005	132,276,000	60,000	134,705,469	61,102	102%	Dec-2
2006	132,276,000	60,000	132,251,749	59,989	100%	Oct-21
2007	110,230,000	50,000	110,212,363	49,992	100%	Oct-25
2008	96,230,790	43,650	93,159,782	42,257	97%	Nov-14
2009	96,230,790	43,650	97,196,405	44,088	101%	Nov-26
2010	58,523,312	26,546	62,663,550	28,424	107%	Nov-17
2011	64,486,755	29,251	67,628,310	30,676	105%	Oct-27
2012	60,996,873	27,668	53,576,189	24,302	88%	Nov-5
2013	65,641,965	29,775	65,741,172	29,820	100%	Oct-15
2014*	72,820,143	33,031	73,695,369	33,428	101%	Oct-26
2015*	66,777,334	30,290	64,934,288	29,454	97%	Nov-2

**Totals are preliminary*
*** 1 mt = 2,204.6 lb*

Over the past decade, the commercial Atlantic herring industry has been consistent in terms of landing states and primary gears. Based on the 10-year average from 2004-2013, a combined 88% of total sea herring catch was landed in Maine and Massachusetts. From 2011-2013, Maine harvested about 50% of the total landings each year. Atlantic herring is primarily caught by trawl gears, which accounted for nearly 70% of total landings in the past decade, followed by purse seine, accounting for 20% of landings. Table 2 shows the landings from primary gears (trawl and purse seine) by state from 2009-2013.

Table 2. Atlantic herring landings by primary gears and state. Due to data confidentiality, landings by other gears are not provided

Year	State	Trawl (lbs)*	Trawl (MT)	Purse Seine (lbs)*	Purse Seine (MT)
2009	MA	120,247,702	54,544	2,676,384	1,214
2009	ME	19,045,539	8,639	42,193,839	19,139
2009	Other NE	2,281,761	1,035	813,497	369
2009	Mid-Atl	22,804,382	10,344	0	0
2010	MA	64,330,228	29,180	2,328,058	1,056
2010	ME	33,939,817	15,395	21,336,119	9,678
2010	Other NE	2,738,113	1,242	92,593	42
2010	Mid-Atl	12,134,118	5,504	0	0
2011	MA	54,936,427	24,919	1,084,663	492
2011	ME	51,887,466	23,536	40,813,760	18,513
2011	Other NE	1,016,321	461	496,035	225
2011	Mid-Atl	7,383,205	3,349	0	0
2012	MA	66,589,943	30,205	2,407,423	1,092
2012	ME	53,887,038	24,443	38,296,107	17,371
2012	Other NE	2,389,786	1,084	0	0
2012	Mid-Atl	12,621,335	5,725	0	0
2013	MA	65,425,914	29,677	1,252,213	568
2013	ME	49,036,918	22,243	49,047,941	22,248
2013	Other NE	1,560,857	708	0	0
2013	Mid-Atl	24,512,947	11,119	0	0

** 1 mt = 2204.6 lb*

The U.S. Atlantic herring fishery is managed as four management areas: inshore Gulf of Maine (Area 1A), offshore Gulf of Maine (Area 1B), Southern New England (Area 2), and Georges Bank (Area 3). In addition to the complementary measures in the federal plan, the Interstate Atlantic Herring FMP implements specific measures for Area 1A's fishery, which supplies bait for lobster, tuna, blue crab, and striped bass fisheries. Management measures include "days out" effort control, spawning area closures, and seasonal quota allocation. Using the annual specifications process, fisheries managers adapt these measures each year to provide herring between June and December, when demand for lobster bait is highest and fishermen can sell

their herring catch for premium value.

1.3.2 Recreational Fishery

The recreational Atlantic herring fishery accounts for less than 1% of total catch in the U.S.A small recreational fishery for Atlantic herring exists, providing late fall to early spring fishing opportunities for both shore and boat anglers. Most Atlantic herring catches are reported during March-April and November-December, with some catches reported from September-October. The Marine Recreational Information Program (MRIP) does not sample during January-February in the north or mid-Atlantic sub-regions and because herring may be taken during this period, total recreational catch may be underestimated. The herring caught by hook and line anglers are taken as a secondary species in a mixed fishery with Atlantic mackerel (*Scomber scombrus*).

1.3.3 Subsistence Fishing

There is no known subsistence fishery for Atlantic herring along the East Coast of the U.S.

1.3.4 Non-Consumptive Factors

Non-consumptive factors for herring are indirect. It is actually herring's role as forage for marine mammals and seabirds that is important. For example, the whale watch industry has expanded in the past few years and seabirds attract additional "non-consumptive" attention.

1.3.5 Interactions with Other Fisheries, Species, or Users

1.3.5.1 Bait

Atlantic herring serves as an important bait for many commercial and recreational fisheries, including lobster, tuna, and striped bass. Increased fishing effort in the lobster fishery, along with a decrease in other sources of lobster bait, has been observed over the past three decades and lobster landings have continued to markedly increase throughout the 1980s and early 1990s, both of which place increased pressure on the herring resource.

While bait herring for the tuna fishery can be purchased from dealers or other boats, some tuna vessels are known to catch herring for use as live bait in this fishery. The use of small pelagic gillnets to catch herring for this purpose is authorized under the Northeast Multispecies Plan. There are no statistics on the extent of this practice or the amount of herring that is taken for this purpose. Some industry participants have estimated that 50-90% of the vessels fishing for tuna in New England waters may be catching herring as bait.

1.3.5.2 Forage

Atlantic herring are an important forage species for many marine finfish, marine mammals and birds in the Northwest Atlantic ecosystem. While available information to quantify the importance of herring as a forage species is not available at this time, there is a substantial amount of literature (Volume II, *The Role of Atlantic Herring, Clupea harengus, in the*

Northwest Atlantic Ecosystem by the NEFMC) that describes the role that herring plays in the ecosystem and estimates the amount of herring consumed by various fish, marine mammal and seabird species. The first step to account for the importance of herring as a forage species in the herring management program is to compile and consider available information on the subject; the second step is to identify where information is lacking and prioritize research needs to fill the data gaps.

1.4 HABITAT CONSIDERATIONS

The New England Fisheries Management Council has identified the Essential Fish Habitat (EFH) for herring and other species it manages, and is proposing updated designations through its Draft Omnibus Habitat Amendment 2. The applicable provisions of this document that relate to Atlantic herring are incorporated into this FMP by reference. This includes the description and identification of herring EFH, the threats to EFH from fishing and non-fishing activities, and the conservation and enhancement measures to protect EFH for Atlantic herring.

1.4.1 Habitat Important to the Stocks

The Northeast U.S. Shelf Ecosystem has been described as including the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream (Sherman et al., 1996; NEFMC, 2005). The continental slope includes the area east of the shelf, out to a depth of 2000 m. Four distinct sub-regions comprise the NOAA Fisheries Northeast Region: the Gulf of Maine, Georges Bank, the Mid-Atlantic Bight and the continental slope. Occasionally another sub-region, southern New England, is described; however, discussions of any distinctive features of this area have been incorporated into the sections describing Georges Bank and the Mid-Atlantic Bight (NEFMC, 2005).

The Gulf of Maine is an enclosed coastal sea, characterized by relatively cold waters and deep basins, with a patchwork of various sediment types. Georges Bank is a relatively shallow coastal plateau that slopes gently from north to south and has steep submarine canyons on its eastern and southeastern edge. It is characterized by highly productive, well-mixed waters and strong currents. The Mid-Atlantic Bight is comprised of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, North Carolina. The continental slope begins at the continental shelf break and continues eastward with increasing depth until it becomes the continental rise. Atlantic herring do not commonly occur over the continental slope (NEFMC, 2005). A more detailed description of habitat important to herring can be found in the Source Document for Amendment 1.

1.4.1.2 Identification and Distribution of Habitat and Habitat Areas of Particular Concern (Essential Fish Habitat)

The Atlantic States Marine Fisheries Commission does not have the authority to designate Essential Fish Habitat (EFH) as required by the Magnuson Stevens Fishery Conservation and Management Act (MSFCMA). The New England Fishery Management Council has identified EFH for a range of species, including Atlantic herring, in order to meet the requirements of

MSFCMA as amended by the Sustainable Fisheries Act. The ISFMP Policy Board approved a recommendation in June 1998 to include Council EFH designation for FMPs or Amendments that are developed jointly or in association with a Council. EFH for Atlantic herring is described in NEFMC (1998a) as those areas of the coastal and offshore water (out to the offshore U.S. boundary of the EEZ) that are designated in Figure 7 through Figure 10 and in Table 3 and meet the conditions below.

The NEFMC, in cooperation with NFMS, has proposed revised EFH designations for herring and other Council managed species through the Draft Omnibus Essential Fish Habitat Amendment 2 (initiated in 2014). EFH designations help the Council identify habitats where adverse impacts should be minimized and encourage conservation of such habitat.

Eggs: Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, but also on aquatic macrophytes, in the Gulf of Maine and Georges Bank as depicted in Figure 7. Eggs adhere to the bottom, forming extensive egg beds that may be many layers deep. Generally, the following conditions exist where Atlantic herring eggs are found: water temperature below 15^{o} C, depths from 20-80 meters and salinity ranging from 32-33$^{o}/_{oo}$. Herring eggs are most often found in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Herring eggs are most often observed during the months from July through November.

Larvae: Pelagic waters in the Gulf of Maine, Georges Bank and southern New England that comprise 90% of the observed range of Atlantic herring larvae as depicted in Figure 8. Generally, the following conditions exist where Atlantic herring larvae are found: sea surface temperatures below 16^{o} C, water depths from 50-90 meters, and salinities around 32$^{o}/_{oo}$. Herring larvae are observed between August and April, with peaks from September through November.

Juveniles: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras as depicted in Figure 9. Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10^{o} C, water depths from 15-135 meters and salinity ranging from 26-32$^{o}/_{oo}$.

Adults: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the mid-Atlantic south to Cape Hatteras as depicted in Figure 10. Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10^{o} C, water depths from 20-130 meters and salinities above 28$^{o}/_{oo}$.

Spawning Adults: Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, but also on aquatic macrophytes. Spawning areas include the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay as depicted in Figure 10. Generally, the following conditions exist where spawning Atlantic herring adults are found: water temperatures below 15^{o} C, depths from 20-80 meters and salinity ranging from 32-33$^{o}/_{oo}$. Herring eggs are spawned in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Herring are most often observed spawning during the months from July through November.

All of the above EFH descriptions include those bays and estuaries listed in Table 3, according to life history stage. There is potential seasonal and spatial variability of the conditions generally associated with this species.

Table 3. EFH Designation of Estuaries and Embayments for Atlantic Herring

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

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).

Figure 7. EFH Designation for Atlantic Herring Eggs

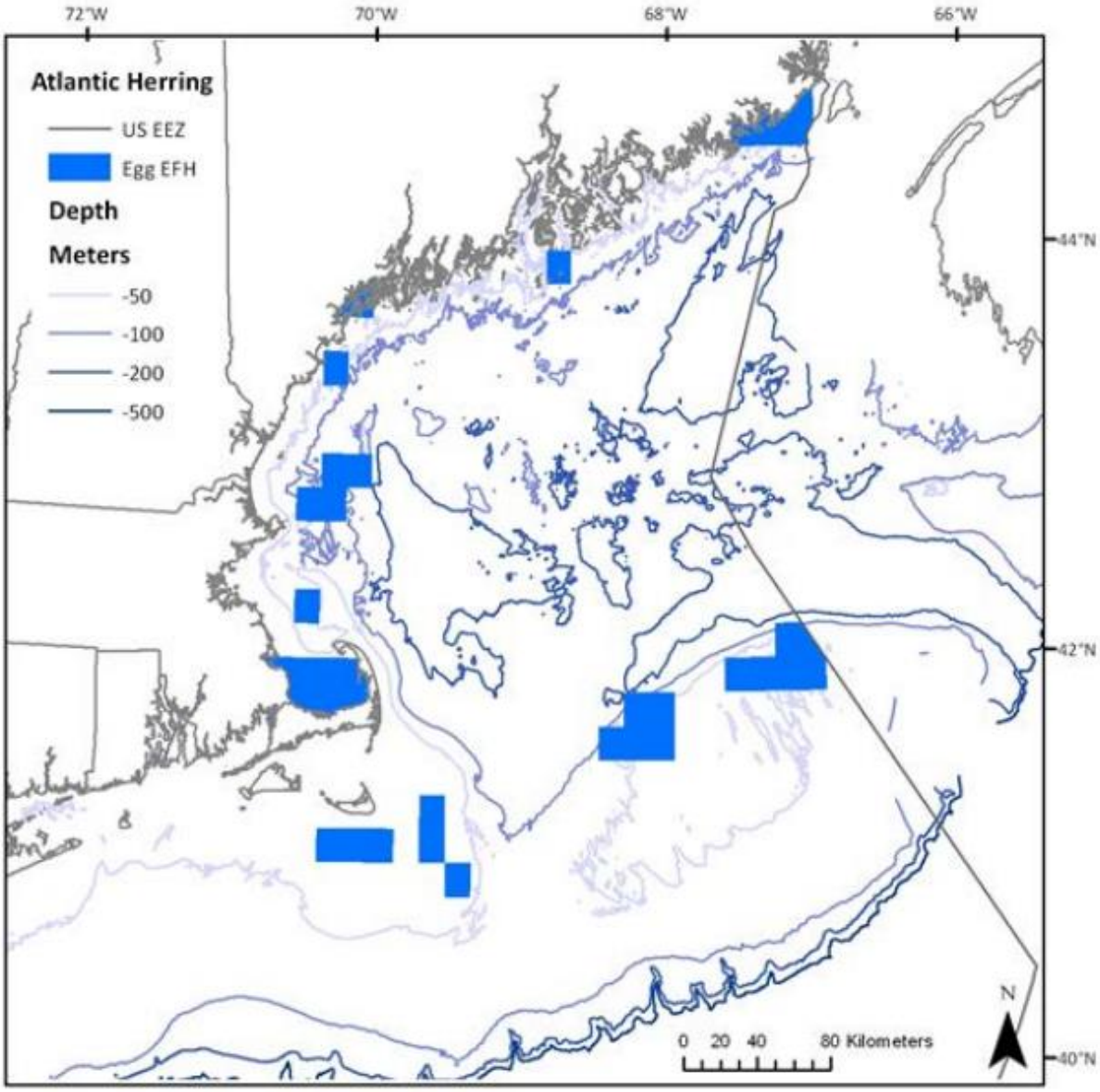


Figure 8. EFH Designation for Atlantic Herring Larvae

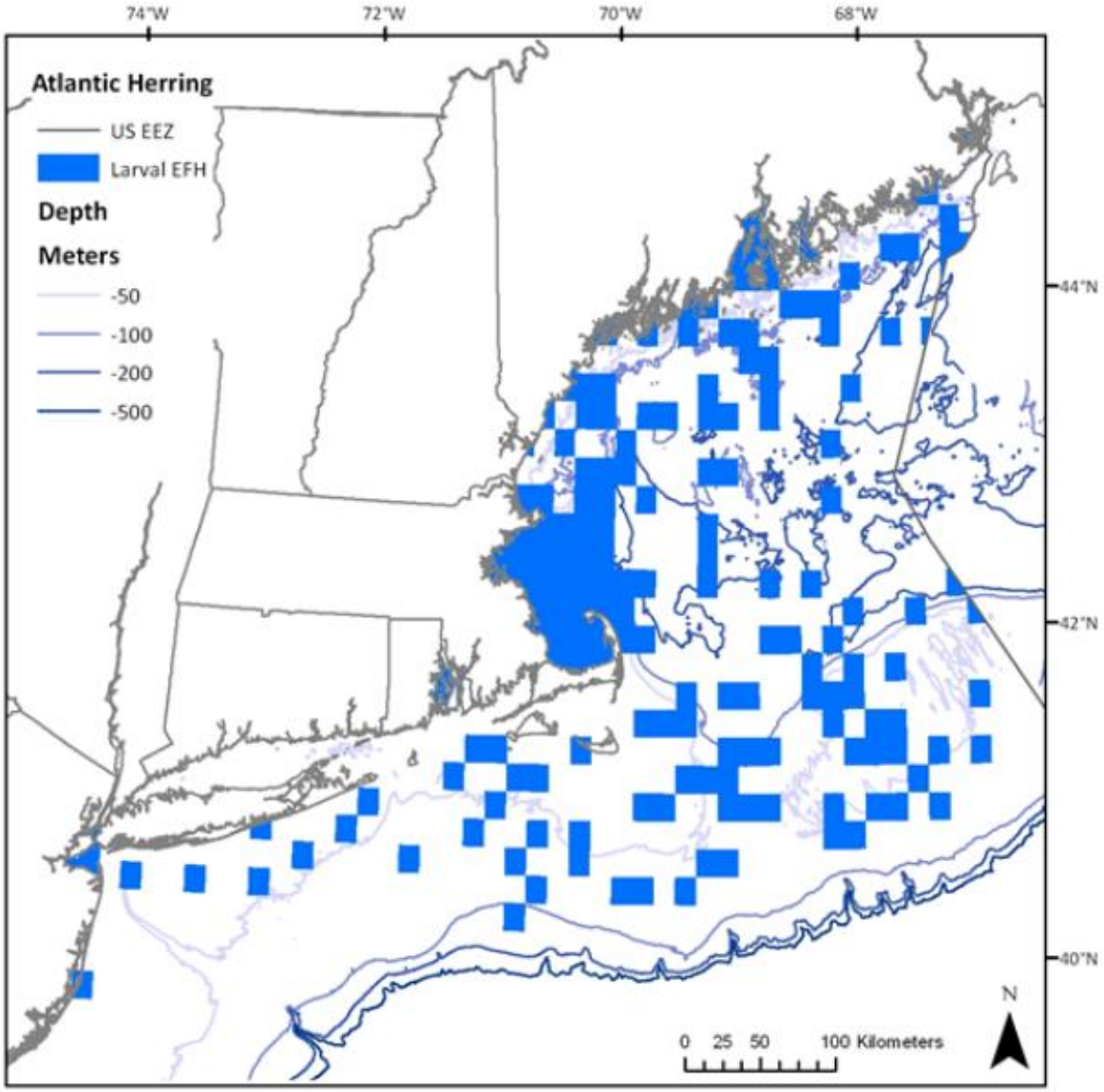


Figure 9. EFH Designation for Atlantic Herring Juveniles

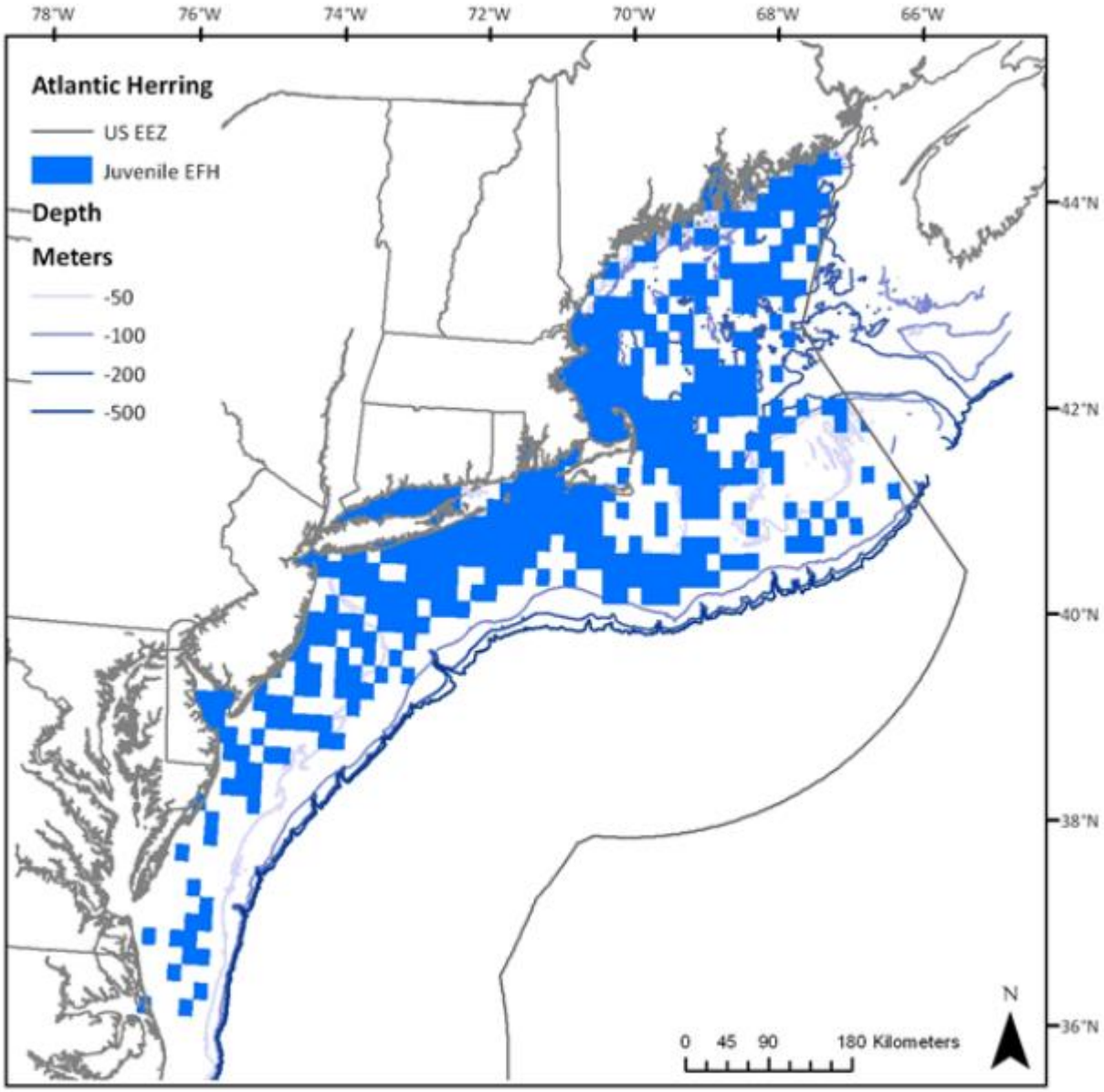
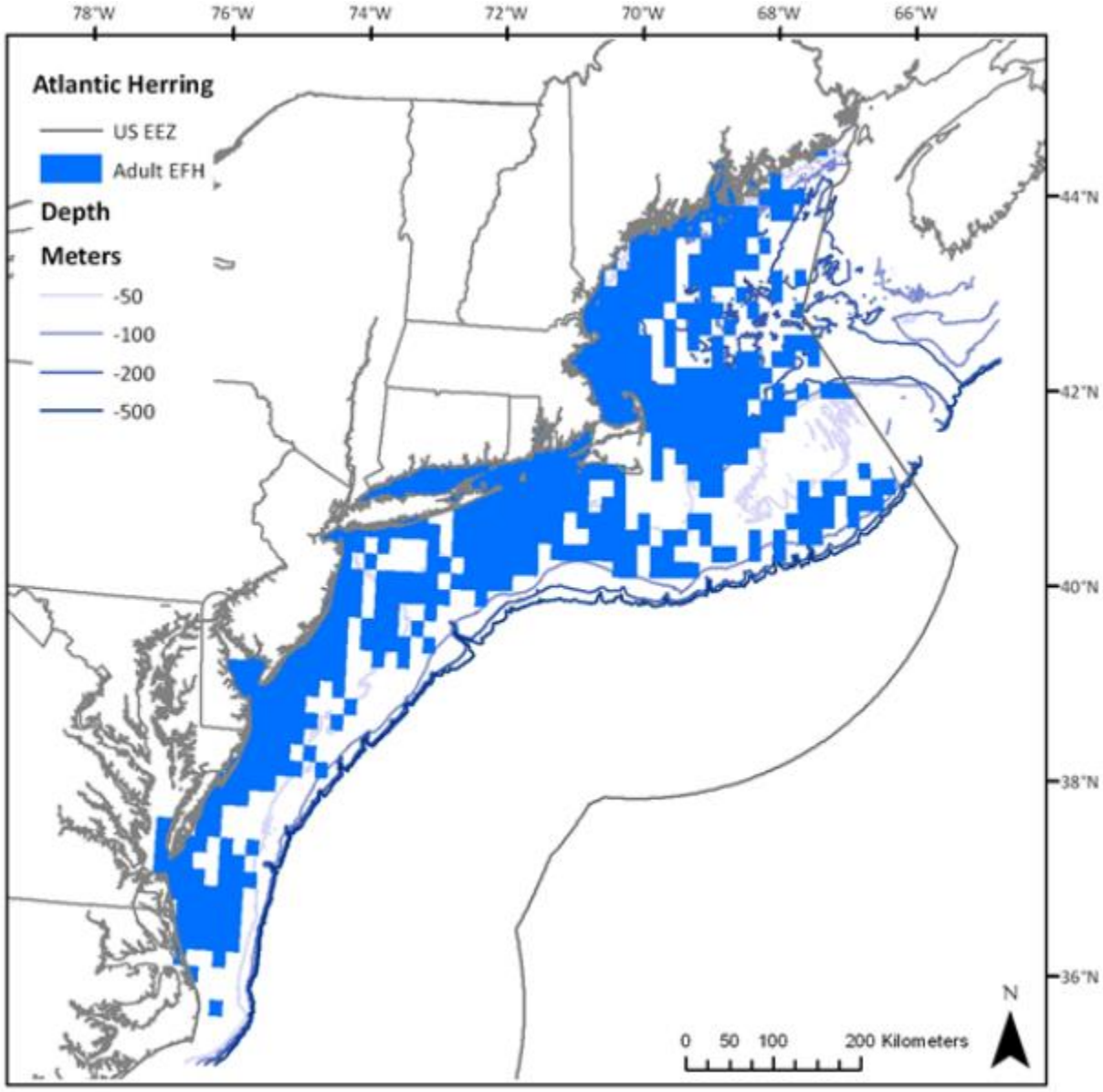


Figure 10. EFH Designation for Atlantic Herring Adults



1.4.1.4. Ecosystem Considerations

Forage: Atlantic herring's role as a forage species, in association with other forage species of concern (i.e. river herring and shad species) in the northwest Atlantic ecosystem, has recently become a concern to many stakeholders.

Other Northeast Region Species: The area where the Atlantic herring fishery takes place has been identified as EFH for species managed under the following Federal Fishery Management Plans: Northeast Multispecies; Atlantic Sea Scallop; Atlantic Monkfish; Summer Flounder, Scup and Black Seabass; Squid, Atlantic Mackerel and Butterfish; Atlantic Surf Clam and Ocean Quahog; Atlantic Bluefish; Atlantic Billfish; and Atlantic Tuna, Swordfish and Shark. All EFH

descriptions and maps can be viewed on the NMFS Northeast Regional Office website (NEFMC, 2005).

Anthropogenic Impacts on Atlantic Herring and their Habitat: Habitat alteration and disturbance can occur through natural processes and human activities. Natural disturbances to habitat can result from summer droughts, winter freezes, heavy precipitation, and strong winds, waves, currents and tides associated with major storms (i.e. hurricanes and northeasters) and global climatic events such as El Nino. Biotic factors, including bioturbation and predation, may also disturb habitat (Auster and Langton MS, 1998 and in press). These natural events may have detrimental effects on habitat, including disrupting and altering biological, chemical and physical processes, and may impact fish and invertebrate populations. Potential adverse effects to habitat from fishing and non-fishing activities may include direct (e.g. contamination or physical disruption), indirect (e.g. loss of prey or reduction of species diversity), site-specific or habitat wide impacts, including individual, cumulative or synergistic consequences of the actions. Non-fishing threats to habitat may include the intentional or accidental discharge of contaminants (i.e. heavy metals, oil, nutrients, pesticides, etc.) from non-point and point sources, and direct habitat degradation from human activities (i.e. channel dredging, marina/dock construction, etc.).

Riverine, inshore and offshore habitats are subject to numerous chemical, biological and physical threats. Riparian habitat is being degraded and altered by many human activities. Inshore regions are variable environments that are threatened by many sources of degradation. Deep-sea habitats are stable and contain less resilient communities than habitats found within inshore waters (Radosh et al., 1978) that are altered by unnatural stress. Pelagic environments in coastal and offshore areas are potentially essential habitat for many marine organisms throughout substantial stages of ontogenetic development. These areas can also be disrupted. Chemical, biological, and physical threats can potentially limit survivorship, growth and reproductive capacity of fish and shellfish species and populations.

The major threats to marine and aquatic habitats are a result of increasing human population, which is contributing to an increase of human generated pollutant loadings. These pollutants are being discharged directly into riverine and inshore habitats by way of point and non-point sources. The development of coastal regions to accommodate more people leads to an increase in unwanted runoff, such as toxicants, nutrients and pesticides. Humans attempt to control and alter natural processes of aquatic and marine environments for an array of reasons, including industrial uses, coastal development, port and harbor development, erosion control, water diversion, agriculture, and silviculture. Environmental conditions of fish and shellfish habitat are altered by human activities (see Wilk and Barr, 1994 for review) and threatened by non-point and point sources of pollution.

Environmental Contaminants: The effects of copper on eggs and larvae of Atlantic herring were reported by Blaxter (1977). Mortality of newly hatched larvae was high at copper concentrations of 1,000 micrograms per liter (mcrg/l). Eggs incubated in 30 mcrg/l had relatively high mortality and premature hatching; 70% of the larvae hatched were deformed. Larvae were more resistant to copper than eggs; survival of larvae was impaired only at concentrations $\geq$ 1,000 mcrg/l. The vertical migration of larvae was impaired at copper concentrations of $\geq$ 300 mcrg/l.

Tests on the effects of sulfuric pollutants such as iron sulfate and hydrogen sulfate, showed that a dilution of 1:8,000 significantly reduced egg fertilization and hatching success, decreased egg diameter, retarded embryonic growth, shortened the incubation period, and increased the rate of structural abnormalities in newly hatched larvae (Kinne and Rosenthal 1967). Larval prey-catching ability was impaired in 1:32,000 and 1:24,000 dilutions; locomotory performance was seriously affected at a 1:16,000 dilution. Permanent deformities and death occurred within a few days at a 1:8,000 dilution.

Studies of dinitrophenol effects on herring embryonic development indicated that low concentrations (0.01 to 0.05 micromole/l) increased embryo activity and altered heart rates significantly (Rosenthal and Stelzer 1970). Various embryonic malformations were also observed. A dinitrophenol concentration of 0.1 micromole/l caused up to a 400% increase in the normal embryonic respiration rate (Stelzer et al. 1971).

Blaxter and Hunter (1982) reported that eggs and larvae held under films of crude oil in concentrations of 1 to 20 ml/l, or in emulsions, experienced toxicities that varied with the origin of the oil. For oil from a particular source, the fractions with the lower boiling points seemed more harmful (Kuhnhold 1969; cited in Kelly and Moring, 1986). In tests on oil dispersants, larvae did not avoid horizontal gradients, but swam into surface dispersant layers and were narcotized (Wilson, 1974). The survival of herring eggs and larvae was highest in water with low biological oxygen demand and low nitrate levels (Baxter and Steele, 1973).

1.4.2 Description of Programs to Protect, Restore, Preserve and Enhance Atlantic Herring Habitat

Federal marine pollution research and monitoring activities are coordinated by NOAA's National Ocean Pollution Program Office. Short and long-term anthropogenic effects on the marine environment are also assessed. NOAA's Ocean Pollution Program Office coordinates interagency responsibilities while the Ocean Assessments Division (OAD) of the Office of Oceanography and Marine Assessments, National Ocean Service, manages assessments.

1.5 IMPACTS OF THE FISHERY MANAGEMENT PROGRAM

1.5.1 Biological and Environmental Impacts

The management program proposed in this amendment aims to maintain effective measures to protect Atlantic herring by updating the science known about inshore spawning events and limiting wasteful fishing practices. The inshore spawning area monitoring program is updated with a review of recent scientific literature and analysis of the spawning maturity rates utilizing data from the past decade. The proposed spawning program, based on the gonad-to-body weight index (also known as gonadosomatic index, GSI), more appropriately addresses the demographics of the current herring resource, which contains older age classes that were depleted during the collapse of the fishery in the 1970s and 1980s. As such, broader age classes result in a spawning season closer to six weeks in length, rather than four weeks, which is the allotted closure period under the current spawning protection program. An extension from four weeks to six weeks in duration is expected to minimize spawning event disruptions to the

resource and reduce the probability of a spawning re-closure which is disruptive to the fishery. Adaptations to the spawning protection program are expected to enhance protections for herring during actual spawning events and reduce dependence on fixed closure dates. The amendment proposes to merge the Western Maine (WM) and Massachusetts-New Hampshire (MA-NH) spawning areas because there have been no significant differences in the starting dates of spawning events between these two areas.

As proposed, the fixed gear set-aside provision is limited to 500 metric tons each year (specified as 295 metric tons for the 2013-2015 fishing years). There is no known biological evidence of Atlantic herring in the Gulf of Maine after November 1. At this time, a removal of the set-aside expiration date of November 1 is not expected to have biological or environmental impacts.

The proposed empty fish hold provision aims to reduce waste from fishing. If effective at incentivizing market-appropriate fishing behaviors, the amount of herring caught in surplus of market demand should be reduced. This provision can benefit bycatch species, such as river herring, through better catch data and monitoring by preventing mixing of catch from multiple trips.

1.5.2 Social Impacts

1.5.2.1 Recreational Fishery

While only 1% of Atlantic herring landings are taken by the recreational fishery, it is primarily used as bait for many species. Herring management affects the recreational fishery indirectly by controlling the availability of herring for bait and for forage (drawing the target species closer to shore where they are then accessible to the recreational industry). So long as management measures work to ensure that herring is not overfished or experiencing overfishing, the recreational fishery will benefit.

1.5.2.2 Commercial Fishery

Issue 1: Spawning Area Efficacy
This amendment proposes changes to the spawning monitoring program, including boundaries, default start dates, and length of the closure period. An adjustment to the Western Maine and Massachusetts-New Hampshire spawning area closure default start date would benefit fishermen because the ability to forecast a closure can provide advanced notice of a closure date.

An extension of the closure period from four to six weeks, which represents one aspect of the potential changes, could potentially have a negative impact on the herring industry. Fishermen and bait dealers note the stock is rebuilt, therefore further protection via a six-week closure is not warranted and will reduce market opportunities. Additionally, fishermen expressed concern that effort by midwater trawlers could be displaced farther northeast, where smaller fish are located, if the spawning closure lasted for six weeks.

Issue 2: Fixed Gear Set-Aside Provision Adjustment
The federal and state FMPs allow for a 500 MT fixed gear set aside. Current specifications are

295 MT will be set-aside for fixed gear fisheries operating in Area 1A (weirs and stop seines) west of Cutler. This set-aside will be available to fixed gear fishermen in Area 1A until November 1. If the set-aside has not been utilized by the fixed gear fisheries west of Cutler by November 1, it will then be made available to the remainder of the herring fleet fishing in Area 1A until the directed fishery in 1A closes. If 92% of the Area 1A TAC has already been reached by November 1 (and the directed herring fishery in 1A is therefore closed), the set-aside will be released as part of the 5% set-aside for incidental catch in 1A (at a 2,000 lb trip limit).

Removal of the fixed gear set-aside November 1 rollover provision would have a neutral impact to the industry, but would require costs to implement consistent adjustments to the state and federal management plans. The fixed gear set-aside is a small portion of the total allowable catch (from 2013-2015, fixed gear set-aside was specified at 295 mt of the base 31,200 mt Area 1A sub-quota). There is potential for a small number of fishermen to increase utilization of fixed gears. While some fishermen have provided anecdotal evidence of Atlantic herring occurring in the Gulf of Maine after November 1, likely due to recent changes in oceanographic conditions, landings data for a ten-year period from 2004 to 2014 indicates that no Atlantic herring have been caught by fixed gear in November and December (Table 3). A removal of the rollover provision brings forth questions on year-to-year rollover if not fully utilized, and may lead to a quota allocation for the fixed gear fishery. Any adjustment to the current rollover provision will not complement the federal FMP.

Issue 3: Empty Fish Hold Provision
A requirement for fish holds to be empty of fish prior to a fishing trip departure would have a positive impact to industry. This option will be an incentive for fishermen to fish more efficiently to market demands by prohibiting vessels from returning to sea with unsold fish in the holds.

The empty fish hold provision applies to vessels departing on a fishing trip (i.e., declared into the fishery), but not for vessels transporting fish from port-to-port (i.e., not declared into the fishery). Waivers could be granted for instances where it is impossible to sell the fish (e.g., refrigeration failure or non-marketable fish). Waivers would not be required for vessels transporting fish from dock-to-dock. At this time, industry supports no limit on waivers issued for legitimate reasons to match the Council's approved option.

1.5.2.3 Subsistence Fishery

It is uncertain to what extent herring may support subsistence fishing in the Mid-Atlantic or South and there does not appear to be subsistence fishing for herring in the Northeast. Because the amendment is attempting to control fishing on herring to smooth out the year's landings, it is anticipated that the measures in this amendment will help maintain access to herring for subsistence needs.

1.5.2.4 Non-consumptive Factors

Herring is considered a primary forage fish for tuna, whales and various other species targeted by recreational fishermen. Consequently, as the commercial herring industry has rebuilt in the last few years, concern has developed in other sectors about whether or not too many herring are being caught. There is no reason to conclude that herring is overfished (according to the biomass estimates), but perception can affect community dynamics and governance.

2.0 GOALS AND OBJECTIVES

2.1 HISTORY OF PRIOR MANAGEMENT ACTIONS

Fishery Management Plan (FMP) (November 1993)
Management of USA Northwest Atlantic herring stocks beyond territorial waters was commenced in 1972 through the International Commission for the Northwest Atlantic Fisheries (ICNAF). The international fishery was regulated by ICNAF until USA withdrawal from the organization in 1976 with Congressional passage of the Magnuson Fishery Conservation and Management Act (MFCMA). Under the aegis of the MFCMA, the New England Fishery Management Council (Council) developed a Fishery Management Plan (FMP) for herring, which was approved by the Secretary of Commerce and was implemented on December 28, 1978. Over the interim period (1976-1978), foreign fishing for herring in USA waters was regulated through a Preliminary Management Plan (PMP) prepared by the National Marine Fisheries Service (NMFS 1995). In 1982, this plan was withdrawn by NMFS and herring was placed on the prohibited species list, eliminating directed fisheries for herring by foreign nationals within the US EEZ and requiring that any herring bycatch by such vessels be discarded. In 1983, an Interstate Herring Management Plan was adopted by the states of Maine, Massachusetts, New Hampshire and Rhode Island, which implemented a series of spawning closures. The states from Maine to New Jersey, acting through the ASMFC, adopted a new FMP in 1994 to address the growth of the herring resource and interest in Internal Waters Processing (IWP) operations.

Amendment 1 (February 1999)
ASMFC's Amendment 1 to the Atlantic Herring Fishery Management Plan (FMP) was developed to complement the NEFMC's federal management plan; it was designed to minimize regulatory differences in fisheries conducted in state and federal waters. Amendment I established management goals and objectives for the U.S. Atlantic herring resource that can only be reached through the successful implementation of both the interstate and federal management plans. The management scheme relies on a total allowable catch (TAC) with effort control measures to avoid overfishing. TACs are developed for specific management areas to reflect the current state of knowledge concerning migratory behavior and mixing rates of the sub-components of Atlantic herring.

Amendment 1 defines overfishing and biological reference points based on an estimate of maximum sustainable yield (MSY) for the entire stock complex. In order to maintain consistency between Amendment 1 and NEFMC's FMP, ASMFC's Atlantic Herring Section adopted the same overfishing definition and biological reference points as in the federal plan, which were

created under guidelines stipulated in the revised Magnuson-Stevens Fishery Conservation and Management Act (MSA) prior to the 2006 re-authorization. Both FMPs provide a process for setting annual specifications and contain institutional frameworks for developing and implementing future management action involving the ASMFC, the New England and Mid-Atlantic Councils, and (possibly) Canada. The plans also include state and federal spawning closures/restrictions and recommendations to prevent damage to herring spawning habitat and egg beds. State effort controls include specific "days out" of the week to slow the fishery's catch rates and extend the fishing season in Management Area 1A.

Addendum I to Amendment 1 (July 2000)
The Section approved Addendum I to re-address the protection of spawning areas and change the due date for annual state compliance reports to February 1. Because NOAA Fisheries disapproved the spawning closures for the federal waters of Management Area 1A (inshore Gulf of Maine), ASMFC developed Addendum I to redefine the state waters spawning areas outlined in Amendment 1. Addendum I also includes measures designed to reduce the exploitation and disruption of herring spawning aggregations by imposing a landing restriction in state ports for herring caught in the spawning areas, except that some states allow a 20% tolerance for spawn herring (Maine and Massachusetts).

Technical Addendum #1A (October 2001) was approved to change the delineation of the Eastern Maine spawning boundary because the spawning aggregations were not adequately protected in 2000.

Addendum II to Amendment 1 (February 2002)
Addendum II was developed in conjunction with NEFMC's Framework Adjustment 1 to allocate the Management Area 1A's TAC on a seasonal basis. This addendum also specifies the procedures for allocating the annual IWP quota.

Amendment 2 (March 2006)
The essential management components of ASMFC's Amendment 2 are consistent with the federal Amendment 1 (final rule published in March 2007). These provisions include identical management area boundaries, joint TAC specifications setting process between NEFMC and ASMFC, and closure of an area when 95% of TAC is harvested and reduction of the possession limit to a 5% bycatch allowance. Despite coordinated development between Amendment 2 and the federal Amendment 1, there remained some inconsistencies. The east of Cutler exemption in *Section 4.3.2.4* of Amendment 2 was not adopted in the federal plan, as it was found to be "inconsistent with National Standard 1 and 3 of the Magnuson-Stevens Act." Conversely, Amendment 1 contains a midwater trawl prohibition in Area 1A from June 1 – September 30, which is not included in the Amendment 2. It is unlikely that there are mid-water trawl vessels lacking federal permits.

Technical Addendum I to Amendment 2 (August 2006)
Upon implementation of Amendment 2, there was inconsistent interpretation of the Zero Tolerance provision. Therefore, a technical addendum was developed to clarify that prohibits any vessel from fishing for, taking, landing, or possessing "spawn" herring within a restricted spawning area except for incidental bycatch and transiting provisions.

Addendum I to Amendment 2 (February 2009)
Addendum I was intended to address effort in Area 1A. It includes a number of tools for the Section to use in order to maintain a steady supply of herring throughout the fishing season. Under Addendum I, states adjacent to Area 1A must set quotas, but can use bi-monthly, trimester, or seasonal quotas and can distribute quota from January – May to later on in the fishing season when the demand and price is greater—as best meets the need of the fishery. This addendum also includes measures to close the fishery when 95% of the quota allocation is harvested and the ability to roll quota into later periods in the event of an under harvest. States are also required to implement weekly reporting in order to manage quotas in a timely manner.

Addendum II (December 2010)
In March 2011, NOAA Fisheries approved Amendment 4 to the federal FMP, bringing it under compliance with the MSA's annual catch limit requirements. Addendum II was developed to mirror the federal Amendment 4. It revises the specifications process and definitions to be consistent with the federal management scheme, in which specifications can be set for up to three years based on best available science. Addendum II also establishes a threshold of 95% of an area's TAC for fishery closure and overage paybacks as accountability measures.

Addendum V (October 2012)
Intended to provide clarity and eliminate inconsistent spawning regulations among various interstate Atlantic herring FMP documents, Addendum V replaces all spawning regulations in previous management documents. It establishes provisions for determining spawning events and the implementation of area closures, and increases the sampling size from two samples of 50 fish to two samples of 100 fish or more. Addendum V includes new boundaries for the four management areas (Figure 11) and identifies the locations of spawning areas subject to closures.

Addendum VI (August 2013)
Developed to complement the NEFMC's Framework Adjustment 2 (final rule published in October 2013), Addendum VI established new provisions and consistent management measures for the four Atlantic herring management areas. States were allowed to seasonally split sub-ACLs for each management area to benefit the fishery. Up to 10% of unused sub-ACL can be carried over to the following fishing year after data is available, provided that the stockwide ACL has not been caught. Addendum VI also set new triggers: a directed fishery will close when 92% of an area's sub-ACL is projected to be reached, and the stockwide fishery will close when 95% of the total ACL is projected to be reached. There is a 2,000 lb. trip limit to allow for incidental bycatch of sea herring for the remainder of the fishing year. In addition, Addendum VI allows for these the directed fishery closure triggers to be set through the specification process.

2.2 GOALS

The goals of Amendment 3 to the Interstate Fishery Management Plan for Atlantic Herring are:

- To achieve, on a continuing basis, optimum yield (OY) for the United States fishing industry and to prevent overfishing of the Atlantic herring resource. Optimum yield is the amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, taking into account the protection of marine ecosystems, including maintenance of a biomass that supports the ocean

ecosystem, predator consumption of herring, and biologically sustainable human harvest. Optimum yield is based on the maximum sustainable yield (MSY) as reduced by any relevant economic, social, or ecological factor, and, in the case of an overfished fishery, provides for rebuilding to a level consistent with producing MSY.

- To provide for the orderly development of the offshore and inshore fisheries, taking into account the viability of current participants in the fishery.

2.3 OBJECTIVES

To meet the goals of Amendment 3, the following objectives shall guide the development of the interstate management program for Atlantic herring:

- To harvest the U.S. Northwest Atlantic herring resource consistent with the definition of overfishing contained in Amendment 3.
- To prevent the overfishing of discrete spawning units consistent with the national standards.
- To avoid patterns of fishing mortality by age which adversely affect age structure of the stock.
- To provide adequate protection for spawning herring and prevent damage to herring egg beds.
- To promote U.S. and Canadian cooperation in order to establish complementary and real-time management practices.
- To implement management measures in close coordination with other Federal and State FMPs.
- To promote research and improve the collection of information in order to better understand herring population dynamics, biology, and ecology, improve science in order to move to real-time management and to improve assessment procedures and cooperation with Canada.
- To achieve full utilization from the catch of herring, including minimizing waste from discards in the fishery.
- To maximize domestic use, such as lobster bait, sardines, and other products for human consumption, and encourage value-added product utilization.
- To promote the utilization of the resource in a manner, which maximizes social and economic benefits to the nation and taking into account the protection of marine ecosystems and its value as a forage species.

2.4 SPECIFICATION OF MANAGEMENT UNIT

The management unit is defined as within U.S. waters of the northwest Atlantic Ocean from the shoreline to the seaward boundary of the Exclusive Economic Zone (EEZ). Because the management unit is limited to U.S. waters, it does not include the entire range of the Atlantic herring population. Various components of the stock complex migrate through Canadian waters, beyond the Atlantic States Marine Fisheries Commission's management authority. The Atlantic herring stock complex is interstate, state-federal and transboundary in nature; therefore, effective

assessment and management can be enhanced through cooperative efforts with state, federal, and Canadian scientists and fisheries managers.

Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and the National Marine Fisheries Service have declared an interest in Atlantic herring.

2.4.1 Management Areas

Currently, Atlantic herring is managed under four management areas in the Gulf of Maine, Georges Bank, and Southern New England (Figure 11). The Gulf of Maine is split into an inshore area (Area 1A) and offshore area (Area 1B). The boundaries of the management areas are consistent with the federal fishery management plan.

The definition of the management area boundaries is based on knowledge of the seasonal distribution and availability of juvenile and adult fish within the area of the management unit, regional differences in the nature and degree of harvesting (different gear types) and processing activity (differences in size and age of fish processed), differences between the inshore and offshore fishing grounds and habitat and the location of known spawning grounds. One of the most important reasons for distinguishing management areas is to avoid over-exploitation of individual spawning populations that are included within the stock complex. Despite the fact that the management unit extends throughout the range of the species in U.S. waters, there is evidence that the U.S. Atlantic herring resource is comprised of separate spawning populations that occupy identifiable areas prior to and during spawning. For the reasons given above, it is appropriate to establish an overall management program that is consistent with unique conditions of the resource and the fishery within separate management areas and that allows for the cooperative management of the resource by different regulatory jurisdictions (the states, the ASMFC and the New England Fishery Management Council).

Amendment 2 redefined areas 1B, 2 and 3, resulting in a larger area covered by Management Area 3. This change from Amendment 1 is based on two recommendations from the 2003 TRAC Meeting: 1) moving the boundary between Areas 1B and 3 to better reflect spawning distributions and minimize reporting errors and 2) moving the Area 2/3 boundary from its previous position (69°) west to 70° to better reflect the distribution and movement of spawning concentrations. These changes are intended to better reflect the distribution of the spawning components of the stock and have been supported by hydroacoustic sampling of the offshore component of the resource.

Area 3 is redefined as originating south of Cape Cod at 4139.00 and 7000.00, northeast to a point on the EEZ at 4253.14 and 6744.35. Continuing south along the EEZ to a point at 3754.00 and 7000.00, then north along 7000.00 longitude to the Cape Cod shoreline.

Management Area 1 (Gulf of Maine):
All US waters of the Gulf of Maine north of a line extending from the eastern shore of Monomoy Island at 41° 35' N. latitude eastward to a point at 41° 35' N. latitude, 69° 00' W. longitude, thence northeasterly to a point along the Hague Line at 42° 53'14" N. latitude, 67° 44'35" W.

longitude, thence northerly along the Hague Line to the US-Canadian border, to include State and Federal waters adjacent to the states of Maine, New Hampshire, and Massachusetts.

Management Area 1 is further divided into two sub-areas. The following points describe the line subdividing this area:

(1)	70° 00' W	(Cape Cod shoreline at 70° 00'W)
42° 38.4' N	70° 00' W	
42° 53' N	69° 40' W	
43° 12' N	69° 00' W	
43° 40' N	68° 00' W	
43° 58' N	67° 22' W;	(the US-Canada maritime Boundary).

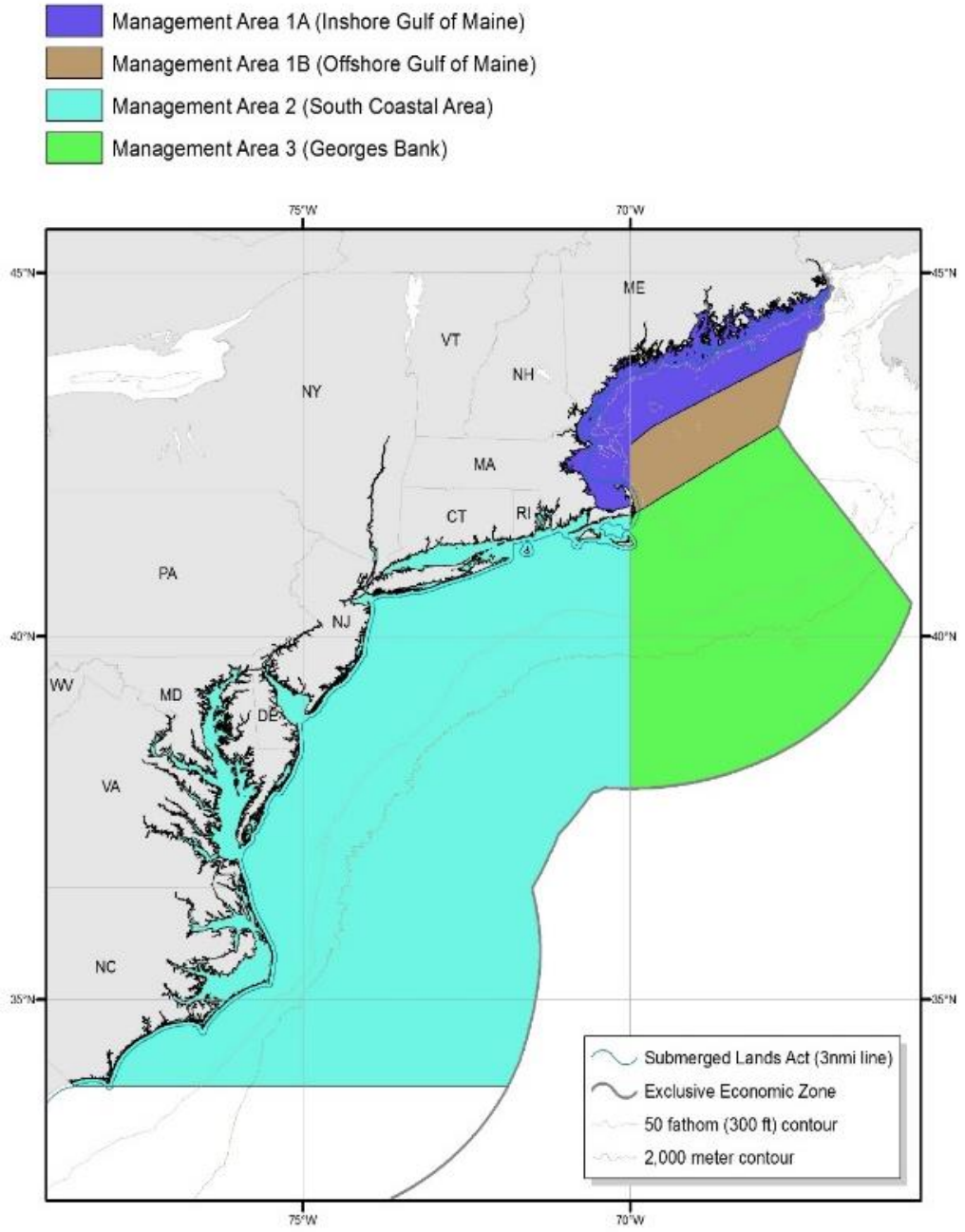
Northward along the irregular US-Canada maritime boundary to the shoreline.

The area inshore of the line is Area 1A, which includes the inshore fishing grounds that have supported most of the catch to date; the area offshore of the line is Area 1B.

Management Area 2 (South Coastal Area):
All waters west and south of the Cape Cod shoreline at 70° 00' W. longitude, to include state and Federal waters adjacent to the states of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia and North Carolina.

Management Area 3 (Georges Bank):
All U.S. waters east of 70° 00' W. longitude and southeast of the line that runs from a point at 70° 00' W. longitude and 41° 35' N. latitude, northeasterly to the Hague Line at 67° 44' 35" W. longitude and 42° 53' 14" N. latitude.

Figure 11. Map of Atlantic Herring Management Areas



2.5 DEFINITION OF OVERFISHING

The 2012 stock assessment for Atlantic herring (54th SAW) employed a Beverton-Holt stock-recruitment curve, estimated internally to the ASAP base run, to produce maximum sustainable yield (MSY) reference points through 2011. Since the previous assessment (NEFSC, 2012), an issue with the contribution of recruitment to the negative log likelihood was discovered. The 2015 operational update, using the ASAP assessment framework, resolved the likelihood issue and included data through 2014.

Based on the 2015 operational update, the overfishing definition is F_{MSY} = 0.24. The stock is considered overfished if SSB is less than half of SSB_{MSY}. SSB_{MSY} was estimated at 311,145 metric tons (mt). The MSY was estimated at 77,247 mt. Since 2009, age-5 fishing mortality has been stable and low, equaling 0.13 in 2011-2013, and equaling the time series low of 0.10 in 2014. The stock is not overfished and overfishing is not occurring (Deroba, 2015).

2.6 STOCK REBUILDING PROGRAM

A rebuilding program is not applicable for the Atlantic herring complex at the present time; however, if it is determined that the herring resource is experiencing overfishing or has become overfished, the Atlantic herring Section will initiate and develop a rebuilding schedule at that time.

2.7 RESOURCE COMMUNITY ASPECTS

Due to the unique and important role that Atlantic herring play in the ecosystem, management considerations should be broader than just traditional fisheries management. Atlantic herring support a valuable commercial fishery for human consumption and provide bait for other fisheries. The market for herring used as lobster bait generally extends from May to November, though August and September are usually the busiest months. The summer restriction on Area 1A to fixed gear and purse seines is said to have led to a significant increase in the price of herring for bait, which has a potentially major impact on the lobster fishery. Notably midwater/pair trawlers are not allowed in Area 1A until October 1, implemented by NEFMC's Amendment 1 to the Herring FMP. Herring also serve as an important prey species for fish, birds and marine mammals. *Section 1.3.5* describes the importance of herring as a forage species.

2.8 IMPLEMENTATION SCHEDULE

[TBD if approved]

3.0 MONITORING PROGRAMS SPECIFICATIONS/ELEMENTS

The Atlantic Herring Technical Committee will meet at least once each year to review the stock assessment and all other relevant and current data pertaining to stock status. The Technical Committee will report on all required monitoring elements outlined in *Section 3* and forward any recommendations to the Atlantic Herring Section. The Technical Committee shall also report to the Management Section the results of any other monitoring efforts or assessment activities not

included in *Section 3* that may be relevant to the stock status of Atlantic Herring or indicative of ecosystem health and interactions.

The Atlantic Herring Advisory Panel will meet at least once each year to review the stock assessment and all other relevant data pertaining to stock status. The Advisory Panel will forward its report and any recommendations to the Management Section.

The Atlantic Herring Plan Review Team will annually review implementation of the management plan and any subsequent adjustments (addenda), and report to the Management Section on any compliance issues that may arise. The PRT will also prepare the annual Atlantic Herring FMP Review and coordinate the annual update and prioritization of research needs (see *Section 6.0*).

State fishery management agencies will utilize the Atlantic Coastal Cooperative Statistics Program (ACCSP) to meet monitoring and reporting requirements of this FMP. The ACCSP partners are the 15 Atlantic coastal states (Maine through Florida), the District of Columbia, the Potomac River Fisheries Commission, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the three Fishery Management Councils, and the Atlantic States Marine Fisheries Commission. Participation by program partners in the ACCSP does not relieve states from their responsibilities in collating and submitting harvest/monitoring reports to the Commission as may be required under this FMP.

3.1 ASSESSMENT OF ANNUAL RECRUITMENT

The Technical Committee and/or Stock Assessment Subcommittee will review annually the status of Atlantic herring recruitment to the coastal stock complex and "other specific groups of herring" as directed by the Section.

3.2 ASSESSMENT OF SPAWNING STOCK BIOMASS

The Technical Committee and/or Stock Assessment Subcommittee will review annually the spawning stock biomass of the Atlantic herring coastal stock complex and "other specific groups of herring" as directed by the Section.

3.3 ASSESSMENT OF FISHING MORTALITY TARGET AND MEASUREMENT

The Technical Committee and/or Stock Assessment Subcommittee will review annually the fishing mortality rate of the Atlantic herring coastal stock complex and "other specific groups of herring" as directed by the Section.

3.4. CATCH AND LANDINGS INFORMATION

Prior to 1994, U.S. landings were collected by a combination of canning industry reports and reports by NMFS port agents. After 1994, harvesters using Vessel Trip Reports (VTR) directly reported U.S. landings data. With implementation of the FMP in 1999, harvesters were required to use VTR and Interactive Voice Reports (IVR). In September of 2011, changes to catch

reporting were instituted to more effectively monitor the sub-ACLs (76 FR 54385). Limited access harvesters are required to report their catch daily via Vessel Monitor System (VMS), while open access permit holders are still required to utilize IVR for weekly reports. All federal permit holders, both limited and open access, must submit VTRs on a weekly basis. Federally licensed dealers are also required to submit weekly reports (NEFMC 2013).
Herring harvesters are required to report discards in addition to landed catch through independent methods (NEFMC 2010). The harvester fills out a hard copy report for each catch by trip (VTR) and are required to send in these reports weekly (NMFS Gloucester). VTR data have a lengthy processing period from the time the reports are sent in to when the data are entered into the database, however VTRs do give very specific information on catch (including location data) and are more precise, making them useful for stock assessments and effort evaluation (NEFMC 2010). VTRs contain landings and discards for all federally permitted harvesters who encounter Atlantic Herring, rather than just limited access permit holders.

Although harvesters are required to report catches with VTR forms, near real-time data is obtained through the IVR and VMS systems, allowing sub-ACLs to be monitored. The VMS system utilizes various satellite technologies and standard forms to allow limited access harvesters to record and submit daily information on catch (kept and discarded) as well as management area. The IVR system is an automated, phone-based reporting method. Open access harvesters are required to report weekly via telephone the amount of herring caught (kept and discarded) from each management area (NMFS Gloucester). VMS and IVR catch reports will be used to verify and determine catch when VTR and/or dealer records are unavailable, but VTR and dealer reports, once received, will determine final catch by area.

Any marine fishery products landed in any state must be reported by a dealer or a marine resource harvester acting as a dealer in that state. Any marine resource harvester or aquaculturist who sells, consigns, transfers, or barters marine fishery products to anyone other than a dealer would themselves be acting as a dealer and would therefore be responsible for reporting as a dealer. Dealer reports include detailed information on amounts landed, price paid and utilization of landings, on a per trip basis. The dealer reports do not contain information on area of catch.

The ACCSP commercial data collection program is a mandatory, trip-based system. All harvesters and dealers are required to report a minimum set of standard data elements (refer to the ACCSP Program Design document for details, http://www.accsp.org/data-collectionstandards). Submission of commercial harvester and dealer reports in the Atlantic herring fishery are required weekly by midnight Tuesday of the following week.

3.4.2 Biological Information

The ACCSP program design calls for the collection of baseline biological data on commercial, for-hire, and recreational fisheries. Biological data for commercial fisheries will be collected through port sampling programs and at-sea observers. Biological data for recreational fisheries will be collected in conjunction with the access-intercept survey. The for-hire sector includes both charter boats and headboats. Biological sampling standards for charter boats are the same as those of recreational fisheries. Sampling for headboats should use at-sea samplers to collect biological data, which may be supplemented by intercept sampling. A minimum set of standard

data elements will be collected in all biological sampling programs (refer to the ACCSP Program Design document for details, http://www.accsp.org/data-collectionstandards). The ACCSP Biological Review Panel, in coordination with the Discard/Release Prioritization Committee, will determine priority and target sampling levels.

3.4.3 Social Information

No ongoing sociological data collection or monitoring is planned. Anecdotal information and insight on the fishery and regulatory changes are provided by the Atlantic Herring Advisory Panel, which maintains active participation. The ACCSP is currently developing standards for collecting sociological data in all fishing sectors.

3.4.4 Economic Information

Federal Atlantic herring dealers will continue to submit trip-level landings reports on a weekly basis (see *Section 3.4*). Data includes the vessel name, gear type, general catch area and amount purchased and can be used for future economic assessments. The ACCSP is currently developing standards for collecting economic data in all fishing sectors.

3.4.5 Observer Programs

The NMFS at-sea observer program is a mandatory program. As a condition of state and/or federal permitting, vessels shall be required to carry at-sea observers when requested. States will implement the ACCSP bycatch/observed module and are required to have mandatory observer coverage (~5%). A minimum set of standard data elements will be collected through the ACCSP at-sea observer program (refer to the ACCSP Program Design document for details). The ACCSP Biological Review Panel, in coordination with the Discard/Release Prioritization Committee, will determine priority and target sampling levels.

In 2015, the final rule for the Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment was published. The amendment explains the methods and processes by which bycatch is currently monitored and assessed; determines whether these methods and processes need to be modified and/or supplemented, and establishes standards of precision for bycatch estimation for all Greater Atlantic Region fisheries. The SBRM can be viewed as a combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. It provides a structured approach for evaluating the effectiveness of the allocation of fisheries observer effort across multiple fisheries.

3.5 BYCATCH REDUCTION PROGRAM

Amendment 3 recommends each state develop a bycatch monitoring program for state permitted vessels participating in the directed herring fishery that mirrors the federal requirements. As such, no action would be taken to implement more specific requirements for observer coverage in the Atlantic herring fishery in state waters. Vessels engaged in the herring fishery and which hold a federal permit would continue to take observers on their vessels as requested by the National Marine Fisheries Service (NMFS). Observer coverage would continue at the discretion

of the NMFS. The information collected from independent fisheries observers helps to improve the collection of bycatch information and improve the monitoring of bycatch in the fishery. With better information, more effective management measures are able to be implemented to discourage bycatch and discards.

NEFMC implemented haddock, river herring and shad bycatch caps, the ASMFC Atlantic Herring Section could initiate an addendum via adaptive management (*Section 4.5*) to modify the Interstate Management Program so that it is complementary to the Federal regulations.

3.6 TAGGING STUDIES/PROGRAM

Historically, tagging programs have been conducted by the Canadian Department of Fisheries, and Oceans and Maine Department of Marine Resources to study migration and spawning behaviors (NOAA Fisheries, 1999)

4.0 MANAGEMENT PROGRAM IMPLEMENTATION

4.1 RECREATIONAL FISHERIES MANAGEMENT MEASURES

No recreational fisheries management measures are proposed in this amendment. Recreational landings of Atlantic herring are currently so small, regulation of this fishery is unnecessary at this time.

4.2 COMMERCIAL FISHERIES MANAGEMENT MEASURES

The following regulations apply solely to Management Area 1A.

4.2.1 Fishing Year

The fishing year for Atlantic herring will be from January 1-December 31; under this measure, revisions developed under the specification process will be implemented with the beginning of the fishing year, January 1.

4.2.2 Specifications

NEFMC Amendment 4 established new terminology in the Herring FMP to be consistent with the Magnuson-Stevens Reauthorization Act of 2006 (MSRA). To avoid confusion between state and federal management, ASMFC adopted the new terminology so the state and federal FMPs have consistent terminology. The overall management scheme was not affected by the new set of definitions, described below.

OFL: Overfishing Level. The catch that results from applying the maximum fishing mortality threshold to a current or projected estimate of stock size. When the stock is not overfished and overfishing is not occurring, this is usually FMSY or its proxy. Catches that exceed this amount would be expected to result in overfishing. The annual OFL can fluctuate above and below MSY

depending on the current size of the stock. This specification will replace the current specification of *allowable biological catch* in the herring fishery.

ABC: Acceptable Biological Catch. The maximum catch that is recommended for harvest, consistent with meeting the biological objectives of the management plan. ABC can equal but never exceed the OFL. ABC should be based on F_{MSY} or its proxy for the stock if overfishing is not occurring and/or the stock is not in a rebuilding program, and should be based on the rebuilding fishing mortality (F_{reb}) rate for the stock if it is in a rebuilding program. The specification of ABC will consider scientific uncertainty.

ACL: Annual Catch Limit. The catch level selected such that the risk of exceeding the ABC is consistent with the management program. ACL can be equal to but can never exceed the ABC. ACL should be set lower than the ABC as necessary due to uncertainty over the effectiveness of management measures. The ACL serves as the level of catch that determines whether accountability measures (AMs) become effective.

OFL > = ABC > = ACL
OFL – Scientific Uncertainty = ABC
ABC – Management Uncertainty = Stockwide ACL = Optimal Yield

AM: Accountability Measure(s). Management measures established to ensure that (1) the ACL is not exceeded during the fishing year; and (2) any ACL overages, if they occur, are mitigated and corrected.

Sub-ACLs. Area-based sub-divisions of the stockwide/total Atlantic herring ACL, intended to minimize the risk of overfishing any stock sub-component. Directed fisheries in a management area will close when 92% of the sub-ACL is projected to be reached, see *Section 4.2.3.6.*

Research Set-Aside (RSA). (RSAs) are allowed in any or all of the herring management areas with a sub-ACL of 0-3%, see *Section 4.2.3.8.*

Fixed Gear Set-Aside (FGSA). This can be specified up to 500 mt in Area 1A and will be returned to the 1A sub-ACL if not utilized by November 1, see *Section 4.2.7.2.*

Acronym	Definition	Considerations
OFL	**Catch at FMAX**	Current stock size
ABC	**Catch at FMSY or Frebuild <=OFL**	Biological uncertainty over current stock size, estimate of F, or other parameters (stock mixing ratios, recruitment, etc.)
ACL	**<=ABC**	Uncertainty from other sources, evaluation of risk to achieving management goals if ABC is exceeded
AM	**Accountability Measures**	(1) minimizing risk of exceeding ACL during the fishing year; (2) addressing ACL overages, if they occur

NEFMC Amendment 4 contains the following AM provisions:

ACL Overage Deduction: This option establishes a process to address ACL/sub-ACL overages in the Atlantic herring fishery. Once the final total catch for a fishing year is determined during the subsequent fishing year using the best available information (including VTR reports to account for incidental catch in other fisheries), any ACL/sub-ACL overage would result in a reduction of the corresponding ACL/sub-ACL for the fishing year after the final total catch is tallied. The ACL/sub-ACL deduction would be equal to the amount that was exceeded. NMFS would make these determinations and publish any changes to the ACLs in the *Federal Register* prior to the start of the fishing year during which the deduction would occur.

Haddock Catch Cap Accountability Measure. This option establishes an AM for the current haddock catch cap, consistent with the establishment of the catch cap as a sub-ACL in the groundfish fishery (NEFMC Amendment 16) and consistent with current regulations regarding the catch cap. When the Regional Administrator has determined that the haddock catch cap has been caught, all vessels issued an Atlantic herring permit or fishing in the Federal portion of the GOM/GB Herring Exemption Area, would be prohibited from fishing for, possessing, or landing herring in excess of 2,000 lb per trip in or from the GOM/GB Herring Exemption Area unless the vessel has a multispecies permit and is fishing on a declared groundfish trip. Upon this determination, possession of haddock would be prohibited for all vessels that possess a limited access Category A or B permit, regardless of where they are fishing.

In addition to changing/replacing the specifications to include OFL, ABC, and ACL, NEFMC Amendment 4 removed JVPt, JVP, IWP, TALFF, and the reserve (Table 4.) because these terms involve foreign fishing vessels who no longer fish in US waters.

Table 4. Specification Naming Adjustments

SPECIFICATIONS PRIOR TO NEFMC AMENDMENT 4	CURRENT SPECIFICATIONS, AS A RESULT OF NEFMC AMENDMENT 4
Allowable Biological Catch (ABC)	Overfishing Limit (OFL)
	Acceptable Biological Catch (ABC)
U.S. Optimum Yield (OY)	U.S. Optimum Yield (OY) (Stock-Wide ACL)
Domestic Annual Harvesting (DAH)	Domestic Annual Harvesting (DAH)
Domestic Annual Processing (DAP)	Domestic Annual Processing (DAP)
Total Joint Venture Processing (JVPt)	N/A
Joint Venture Processing (JVP)	N/A
Internal Waters Processing (IWP)	N/A
U.S. At-Sea Processing (USAP)	U.S. At-Sea Processing (USAP)
Border Transfer (BT)	Border Transfer (BT)
Total Allowable Level of Foreign Fishing (TALFF)	N/A
RESERVE	N/A
TAC Area 1A	TAC Area 1A (Sub-ACL)
TAC Area 1B	TAC Area 1B (Sub-ACL)
TAC Area 2	TAC Area 2 (Sub-ACL)
TAC Area 3	TAC Area 3 (Sub-ACL)

Research Set-Aside	Research Set-Aside (and/or Other Set-Aside)

4.2.2.1 Specification Setting Process

The Atlantic Herring Section will set specifications for up to three years using the following general process. If the Section does set specifications for three years, it is recommended that the TC review the specifications during each interim year and provide updates to the Section. The Section can make mid-year adjustments by a majority vote during any Section meeting that has sufficient attendance to form a quorum.

1. The TC will review the best available science, which is likely be the most recent stock assessment and/or stock assessment and fishery evaluation (SAFE) report prepared by the PDT. ASMFC staff will facilitate TC involvement in PDT meetings (or schedule joint meetings) during the development of the SAFE report. The PDT and TC currently have significant overlap of membership making joint meetings practical at this time.

2. Following the review, the TC will make recommendations to the Section for the following:
   - OFL estimates for one to three fishing years, based on the point estimates of FMSY (or its proxy) and the point estimate of future stock size.
   - ABC recommendations for one to three fishing years, based on either FMSY (if the stock is not in a rebuilding program) or FREB (if the stock is in a rebuilding program). If possible, the Herring TC recommendation should report the catch that is expected to result from the point estimates of the target fishing mortality rate and projected stock size (i.e., the OFL). If the TC recommends reducing the ABC from this amount, the recommendation should include an explicit discussion of the scientific uncertainties that are taken into account in developing the recommendation.
   - ACL recommendations, taking into account necessary adjustments for Canadian catch (New Brunswick weir fishery), state waters landings, discards, and other sources of potential management uncertainty (risk).
   - An evaluation whether the ABC and the ACLs have been exceeded in earlier years.

3. The Atlantic Herring Section will review TC recommendations and set specifications prior to the opening of the fishing season. Prior to the Section taking final action, ASMFC staff will facilitate joint meetings of the NEFMC Herring Committee and Section to review progress and give guidance to the PDT/TC during the development of the SAFE report. There is significant overlap between the Herring Committee and Section making joint meetings practical at this time.

4.2.3 Total Allowable Catch / Sub-Annual Catch Limit

4.2.3.1 Determination of Quota Periods

Before or at the ASMFC Annual Meeting, Section members from Maine, New Hampshire, and Massachusetts must meet and agree on quota specifications, including the quota period system,

and whether to allow fishing before June 1. In the event that the states cannot come to an agreement at the meeting, the matter will be resolved by the full Section at the Annual Meeting.

4.2.3.2 Quota Periods

Quota periods shall be determined annually, as specified in *Section 4.2.3.1*. The Area 1A sub-ACL shall be distributed using bi-monthly, trimester, or seasonal quota periods whichever meets the needs of the fishery. If a quota period is closed early due to the full allocation being harvested, vessels are prohibited from landing more than 2,000 lbs. of Atlantic herring per trip until the next quota period begins.

Bi-monthly periods are established as follows:
Period 1: January 1 – February 28 (29)
Period 2: March 1 – April 30
Period 3: May 1 – June 30
Period 4: July 1- August 31
Period 5: September 1 – October 31
Period 6: November 1 – December 31

Trimesters are established as follows:
Trimester 1: January 1 – May 31
Trimester 2: June 1 – September 30
Trimester 3: October 1 – December 31

Seasons are established as follows:
Season 1: January 1 – September 30
Season 2: October 1 – December 31

In addition to having flexibility to choose between bi-monthly, trimester, or seasonal quotas, quota from the January 1 – May 31 period may be allocated to later in the fishing season in response to conditions in the fishery. The January 1 – May 31 period quota may be distributed to each remaining period proportional to the quota share of the remaining periods. If the bi-monthly periods with no landings before June 1 option is selected, the Section has the option to count June as its own period, or December as its own period (Table 5).

The allocations percentages for each quota period system were derived from Vessel Trip Reports from 2000 – 2007 and represent historical fishing effort that was driven by market demand for herring (Table 5 and 6). These allocation percentages are fixed and can only be changed through a subsequent addendum or amendment.

The 2016-2018 specifications allocate Area 1A's sub-ACL through seasonal quotas with no landings before June 1; 72.8% will be available from June 1 – September 30 and 27.2% will be available from October 1 – December 31.

Table 5. Bi-monthly quota percent allocations. Percentages were calculated using vessel trip reports from 2000 – 2007

Bi-Monthly Quotas								
January – December			No Landings Prior to June 1 (with June as a one-month period)			No Landings Prior to June 1 (with December as a one-month period)		
Period	**Months**	**%**	**Period**	**Months**	**%**	**Period**	**Months**	**%**
1	Jan/Feb	1.5%	1	June	16.4%	1	June/July	36.8%
2	Mar/Apr	2.3%	2	July/Aug	40.1%	2	Aug/Sep	36.0%
3	May/June	24.0%	3	Sep/Oct	34.0%	3	Oct/Nov	27.1%
4	July/Aug	34.6%	4	Nov/Dec	9.5%	4	Dec	0.2%
5	Sep/Oct	29.4%						
6	Nov/Dec	8.2%						

Table 6. Trimester and seasonal quota percent allocations. Percentages were calculated using vessel trip reports from 2000 – 2007

Trimesters			Seasonal Quotas					
January – December			January - December			No Landings Prior to June 1		
Trimester	**Months**	**%**	**Season**	**Months**	**%**	**Season**	**Season**	**%**
1	Jan - May	13.7%	1	Jan - Sep	76.5%	1	Jun - Sep	72.8%
2	Jun - Sept	62.8%	2	Oct - Dec	23.5%	2	Oct - Dec	27.2%
3	Oct - Dec	23.5%						

4.2.3.3 Seasonal Splitting of Quota for Areas 1B, 2, and 3

States are allowed to seasonally split the sub-ACLs in all management areas to maximize value to the Atlantic herring fisheries. The actual splits (amounts or percentages by months, trimesters, or seasons) would be set as part of the specifications process.

4.2.3.4 Quota Rollover for All Management Areas

Allow for up to 10% of quota in a management area to carry over to the first fishing year after final landings data are available, within that same management area, provided that the ACL is not exceeded for the entire fishery. The stock-wide ACL cannot be changed from the annual specification. The intent of a quota rollover is to provide some flexibility to the fishing industry. Furthermore, unused quota in one period may be rolled over to the next period within the same fishing year.

Under management measure 4.2.3.4, the following provisions apply:

- All harvest control measures continue to apply to stockwide and sub-ACLs.
- All carryovers are based on initial sub-ACL allocations for the fishery year.
- Sub-ACL underages are determined based on the same methodology used to determine sub-ACL overages.
- Sub-ACL carryovers are only authorized if the total ACL for the fishing year is not exceeded.

- Provisions for carryovers, including percentages/amounts, can be modified in the future through the herring fishery specifications process (in addition to framework adjustments and amendments).
- Unused quota may be rolled from one period to the next within the same year.

4.2.3.5 ACL/Sub-ACL Overage Deduction (Accountability Measures)

This measure establishes annual paybacks for ACL/Sub-ACL overages.

Once a final total catch for a fishing year is determined during the subsequent fishing year using the best available information (including VTR reports to account for incidental catch in other fisheries), ACL/Sub-ACL overage would result in a reduction of the corresponding ACL/sub-ACL for the fishing year after the final total catch is tallied. The deduction will be equal to the amount that was exceeded.

NEFMC is required to implement AMs as part of MSRA. NMFS' Guidelines state that accountability measures are management controls implemented for stocks such that exceeding the ACL is prevented, where possible, and corrected or mitigated if it occurs. NMFS suggests that three kinds of AMs that could be considered: (1) those that can be applied in-season, designed to prevent the ACL from being reached; and (2) those that are applied after the fishing year, designed to address the operational issue that caused the ACL overage and ensure that it does not happen in subsequent fishing years, and, as necessary, address any biological harm to the stock; and (3) those that are based on multiyear average data which are reviewed and applied annually. AMs should address and minimize the frequency and magnitude of overages and should be designed so that if an ACL is exceeded, specific adjustments are effective in the next fishing year or as soon as possible. Multi-year specifications (like those for the Atlantic herring fishery) should include AMs that provide for automatic adjustments in the subsequent year's harvest if an ACL is exceeded in one year.

Several of the management measures in the Atlantic herring fishery function as AMs as described above. These measures are designed primarily to prevent the management area TACs (ACLs) from being exceeded during the fishing year, as well as improve the likelihood that OY can be caught on a continuing basis while preventing overfishing.

Specifically, NMFS and ASMFC will close the directed fishery when 92% of a management area's sub-ACL is projected to be harvested, as specified in *Section 4.2.3.6*. This precautionary closure helps ensure that an area's sub-ACL is not exceeded.

4.2.3.6 Harvest Control Measures: Sub-ACL Trip Limit Triggers

For all management areas, directed fisheries in a management area will close when 92% of the sub-ACL is projected to be reached, and then the stock-wide fishery will close when 95% of the total ACL is projected to be reached. A 2,000 pound bycatch allowance will continue when the directed fishery is closed.

4.2.3.7 Specification Process for Sub-ACL Triggers

Sub-ACL triggers will be set using the annual specification process.

4.2.3.8 Research Set-Asides (RSAs)

The Atlantic Herring Section and the New England Fishery Management Council may establish a mechanism to set aside a percentage of one or more management area's sub-ACL to help support research on the herring stock complex and fishery. This measure authorizes NEFMC and ASMFC to set-aside 0 - 3% of the sub-ACL from any management area(s) or the stockwide ACL for the herring fishery to support herring related research. The Council and Section will determine the specific percentages for the research set-asides and the management area(s) to which they apply during the fishery specification process**. The research set-aside is intended to be in addition to the current 5% set-aside for incidental catch once the directed fishery in a management area closes.**

4.2.4 Effort Controls

Effort controls are designed to slow the catch rate of herring to minimize early closures and allow the sub-ACL to be utilized throughout the entire period. ASMFC controls Atlantic herring catch rates though 'days out' (i.e. 4 'days out' should be interpreted on a weekly basis, which means 4 out of 7 days in a week will be no landings days). The 'days out' is designed to allow a vessel to land fish taken from an open area with no 'days out' restrictions.

4.2.4.1 Determination of Days Out

To prevent an early closure of a management area or sub-area, 'days out' specifications may be set during the initial meeting between Section members from Maine, New Hampshire, and Massachusetts or can be set at specific 'days out' meetings or conference calls as necessary. The states will annually agree to the start date, the number of 'days out' of the fishery, as well as which consecutive days of the week will have landing restrictions. While the start time for the landing restriction may vary by state, the states must implement the landing restriction for the same consecutive days each week.

If states adjacent to Area 1A cannot agree which day to designate as 'days out', then the matter will go before the full Section for review during the next ASMFC meeting week or at a special meeting of the Section called by the Chairman.

All agreements are final when the meeting is adjourned. Adjustments to 'days out' specifications can only be made if states hold another meeting or conference call and agree on the specification changes.

4.2.4.2 Days Out

Harvesters are prohibited from landing herring during a 'day out'. In addition, vessels may only land once per calendar day on any day that is open to landing (not a 'day out').

Vessels with an Atlantic herring permit are not prohibited from participating in other fisheries for other species in restricted areas during days out of the Atlantic herring fishery. Landing of herring taken from management areas without 'days out' restrictions will be allowed on 'days

out' in Area 1A. Any vessel transiting an area closed to fishing with legally caught herring on board must have its fishing gear stowed.

During a 'day out', vessels participating in other fisheries may land an incidental catch of herring that does not exceed 2,000 pounds per trip during a 'day out'. Vessels may not land more than 2,000 pounds of herring per day caught in an area closed to directed herring fishing. Vessels transiting a closed area with more than 2,000 pounds of legally caught herring on board must have all seine and mid-water trawl gear stowed.

Fixed gear fishermen may remove and land herring from the gear (weirs and stop seines) on the days designated as a 'day out' of the fishery.

4.2.5 Timely Reporting of State Landings

The need for accurate and timely reporting by all harvesters is necessary for successful monitoring of any of the quotas included in this document.

States are required to implement weekly reporting by all non-federally permitted fishermen on Atlantic herring (including mobile and fixed gear). Weekly reporting can be achieved by use of the existing federal interactive voice reporting (IVR), ACCSP electronic data collection methods (eTRIPS, eDR), state logbooks or a similar system which collections all required data elements. Negative reports must be included in any system implemented by a state.

States are required to prohibit non-federally permitted fishermen, directing on herring, from landing herring until they are able to report their catch weekly as described above.

4.2.6 Spawning Restrictions

4.2.6.1 Spawning Area Closure Monitoring System

The PDT conducted a review of scientific literature and analyzed the female gonadosomatic index (GSI) data for a decade to inform an updated GSI-based spawning monitoring system (see Appendix 1. *Technical Report on Atlantic Herring GSI-Based Spawning Monitoring Program*). Female GSI is a calculation of the gonad (ovary) mass as a proportion of the total body mass and it is used as a tool to measure herring maturity. GSI values can be interpreted as the ratio of herring body weight that is comprised of the ovary. As such, a larger GSI value indicates advanced maturity and larger ovaries.

Currently GSI samples are obtained directly from the commercial herring fishery, however it is not always possible to collect sufficient data to inform the start of the spawning closure, therefore a system that forecasts closure dates is recommended by the PDT (Option C).

The spawning closure monitoring system options in this section have associated default closure dates in Section 4.2.6.2. If selecting Option C, a GSI trigger must also be specified in Section 4.2.6.2.

Option A. Status Quo
Closures in a given area will begin based on the spawning condition of Atlantic herring as determined from commercial catch samples. Commercial catch sampling shall begin by at least August 1 for the Eastern and Western Maine areas, and by at least September 1 for the Massachusetts/New Hampshire area. If sufficient samples are not available, closures will begin on the default dates.

Sufficient sample information shall mean at least two (2) samples of 100 fish or more, in either length category, taken from commercial catches during a period not to exceed seven days apart.

Closures in a given area will begin seven days after the determination that female herring in ICNAF gonadal stages III - V from that specific area have reached the following spawning conditions: female herring greater than 28 cm in length have reached a mean GSI of 20; or female herring greater than or equal to 23 cm and less than 28 cm in length have reached a mean GSI of 15.

Length refers to the mean natural total length, measured from the tip of the snout to the end of the caudal fin in normal position. "GSI" shall mean gonadosomatic index calculated by the following formula. Length refers to the mean natural total length, measured from the tip of the snout to the end of the caudal fin in normal position. "GSI" shall mean gonadosomatic index calculated by the following formula:

GSI = [Gonad Weight / (Total Body Weight - Gonad Weight)] x 100 percent.

Option B. Status Quo with Adjustments (updated language is underlined)
Closures in a given area will begin based on the spawning condition of Atlantic herring as determined from <u>fishery dependent or independent samples</u>. Sampling shall begin by August 1 for the Eastern and Western Maine areas, and by at least September 1 for the Massachusetts/New Hampshire area. If sufficient samples are not available, closures will begin on the default dates (*see Section 4.2.6.2 for dates*).

Sufficient sample information shall mean at least two (2) samples of 100 fish or more, in either length category, taken from <u>fishery dependent or independent sources within a spawning closure area by Maine, New Hampshire or Massachusetts. The fishery will remain open if sufficient samples are available, and they do not contain female herring in ICNAF gonadal stages III – V.</u>

Closures in a given area will begin seven days after the determination that female herring in ICNAF gonadal stages III - V from that specific area have reached the following spawning conditions: female herring greater than 28 cm in length have reached a mean gonadosomatic index (GSI) of 20%; or female herring greater than or equal to 23 cm and less than 28 cm in length have reached a mean GSI of 15%.

Length refers to the mean natural total length, measured from the tip of the snout to the end of the caudal fin in normal position. “GSI” shall mean gonadosomatic index calculated by the following formula. Length refers to the mean natural total length, measured from the tip of the snout to the end of the caudal fin in normal position. “GSI” shall mean gonadosomatic index calculated by the following formula:

GSI = [Gonad Weight / (Total Body Weight - Gonad Weight)] x 100 percent.

Option C: GSI_{30}-Based Forecast System
The closure date for a spawning area will be projected based on a minimum of three (3) fishery dependent or independent samples, each containing at least 25 female herring in ICNAF gonadal stages III-V. Because larger herring spawn first, female GSI values will be standardized to that of a 30 cm fish, (95th percentile of observed female herring lengths) using the following formula:

$$GSI_{30} = GSI_{obs} + 1.84 * (30 - TL_{cm})$$

When a significant positive relationship is detected between GSI_{30} and date, the slope of this line will be used to forecast a closure date. The forecasted closure date will be the day where GSI_{30} is projected to exceed the selected trigger value. As additional samples are collected, the forecast will be updated and fine-tuned. Once the forecasted date is within 5 days, the spawning closure will be announced. If no significant increase in GSI_{30} is detected prior to the default closure date, the default closure date would apply (see *Section 4.2.6.2* for default dates).

GSI_{30} Trigger Value: Spawning occurs at the completion of maturity stage V. Therefore, a point near the high end of observed GSI values for stage V fish should be used as the trigger. A higher value closes the fishery later and just prior to spawning, whereas a lower value provides additional protection for maturing fish. In other words, higher GSI values indicate increased maturation and spawning readiness.

70th Percentile : GSI_{30} Trigger = 23
Closes the fishery at an earlier date to provide more protection for maturing fish, but may not provide complete protection for spawning fish.

80th Percentile: GSI_{30} Trigger = 25
Closes the fishery in the later stages of maturity, but before spawning.

90th Percentile: GSI_{30} Trigger= 28
Closes the fishery just prior to spawning.

4.2.6.2 Default Closure Dates

The PDT recommends adjusting the method for triggering a closure in a spawning area. Currently GSI samples are obtained directly from the commercial herring fishery, however it is

not always possible to collect sufficient data to inform the start of the spawning closure. As such, default closure dates were established for each of three spawning areas with a presumed general north-south progression of spawning.

Analysis of GSI data from 2004-2013 suggests onset of spawning can vary by five or more weeks from year-to-year. This observation is corroborated by scientific studies on herring spawning times (Boyar 1968; Grimm 1983; Stevenson 1989; Winters and Wheeler 1996). Median trigger dates were calculated for the period 2004-2013 using the formula and trigger values described under Section 4.2.6.1 Option C. In other words, Sub-Options C1-C3 represent the average date a GSI trigger would have been reached in previous years. Insufficient data were available for the Eastern Maine area, so a value derived from literature sources (Stephenson 1989) is used for options A through C for the Eastern Maine area.

Option A: Status Quo
If sufficient samples are not available, closures will begin on the following dates.

Eastern Maine Spawning Area:	August 15
Western Maine Spawning Area:	September 1
Massachusetts/New Hampshire Spawning Area:	September 21

Option B: Status Quo with Adjustments
If sufficient samples are not available, closures will begin on the following dates.
These dates match Option A and are associated with Option B in Section 4.2.6.1.

Eastern Maine Spawning Area:	August 15
Western Maine Spawning Area:	September 1
Massachusetts/New Hampshire Spawning Area:	September 21

Option C: Default Dates Associated with GSI_{30} Trigger Values
If sufficient samples are not available, closures will begin on the following dates associated with the respective GSI_{30} trigger value. *Please specify a trigger sub-option when selecting C.*

- **Sub-Option C1: 70th Percentile (GSI_{30} Trigger = 23)**
  Closes the fishery at an earlier date to provide more protection for maturing fish, but may not provide complete protection for spawning fish.

Eastern Maine Spawning Area:	August 28
Western Maine Spawning Area:	September 25
Massachusetts/New Hampshire Spawning Area:	September 25
Tri-State (WM-MA/NH) Spawning Area*:	September 25

- **Sub-Option C2: 80th Percentile (GSI_{30} Trigger = 25)**
  Closes the fishery in the later stages of maturity, but before spawning.

Eastern Maine Spawning Area:	August 28
Western Maine Spawning Area:	October 4
Massachusetts/New Hampshire Spawning Area:	October 4
Tri-State (WM-MA/NH) Spawning Area*:	October 4

- **Sub-Option C3: 90th Percentile (GSI_{30} Trigger = 28)**
  Closes the fishery just prior to spawning.

Eastern Maine Spawning Area:	August 28
Western Maine Spawning Area:	October 17
Massachusetts/New Hampshire Spawning Area:	October 17
Tri-State (WM-MA/NH) Spawning Area*:	October 17

**Tri-State Spawning Area options if Option B in Section 4.2.6.3 is selected.*

4.2.6.3 Spawning Area Boundaries

The PDT evaluated 1) sub-dividing the Massachusetts/New Hampshire spawning area, and 2) combining Western Maine and Massachusetts/New Hampshire spawning areas. Anecdotal reports from industry suggested there was variation in the spawning season within the MA/NH area (i.e., spawning occurs earlier to the north). A potential alternative to sub-divide the MA/NH area was initially proposed, however, upon review of the GSI data from both the Massachusetts Division of Marine Fisheries and Maine Division of Marine Resources sampling programs, this does not appear to be needed. In fact, both programs track each other well and the combined dataset appears well-suited to continue to inform the initiation of the MA/NH spawning closure. Therefore, the PDT has found the current spawning area boundaries (Figure 12) within MA/NH are adequate and further sub-areas are not warranted.

The PDT also reviewed the spawning onset times in the Western Maine and Massachusetts/New Hampshire spawning areas. After adjusting to a standard 30 cm fish, there is no significant difference in the spawning onset times between the two spawning areas. The PDT recommends merging these two areas into one to increase the number of samples available to inform spawning closures (Option B). If the WM and MA/NH spawning areas were merged then the spawning area monitoring system would collect samples from two spawning areas, instead of three.

Figure 12. ASMFC Atlantic Herring Spawning Areas

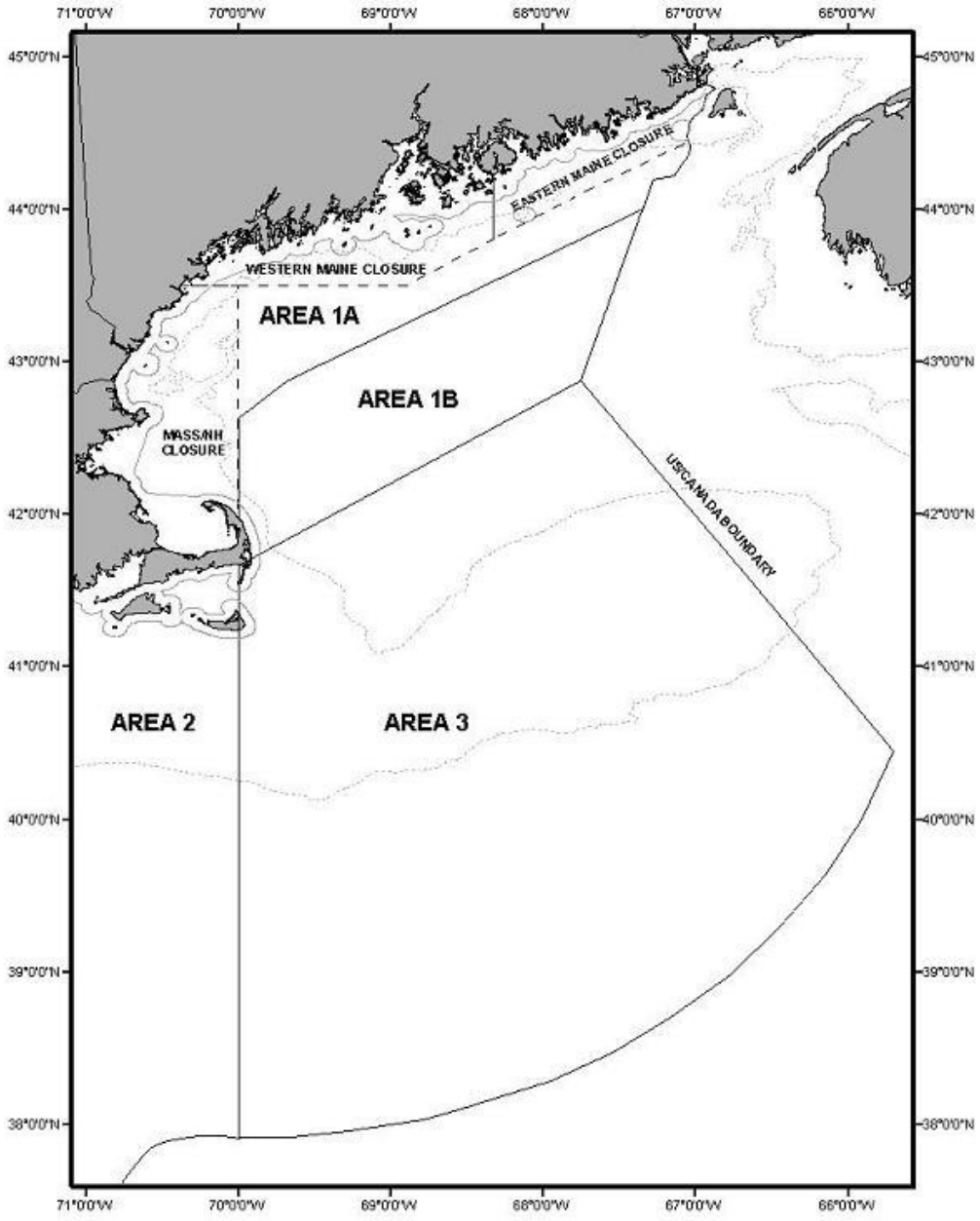
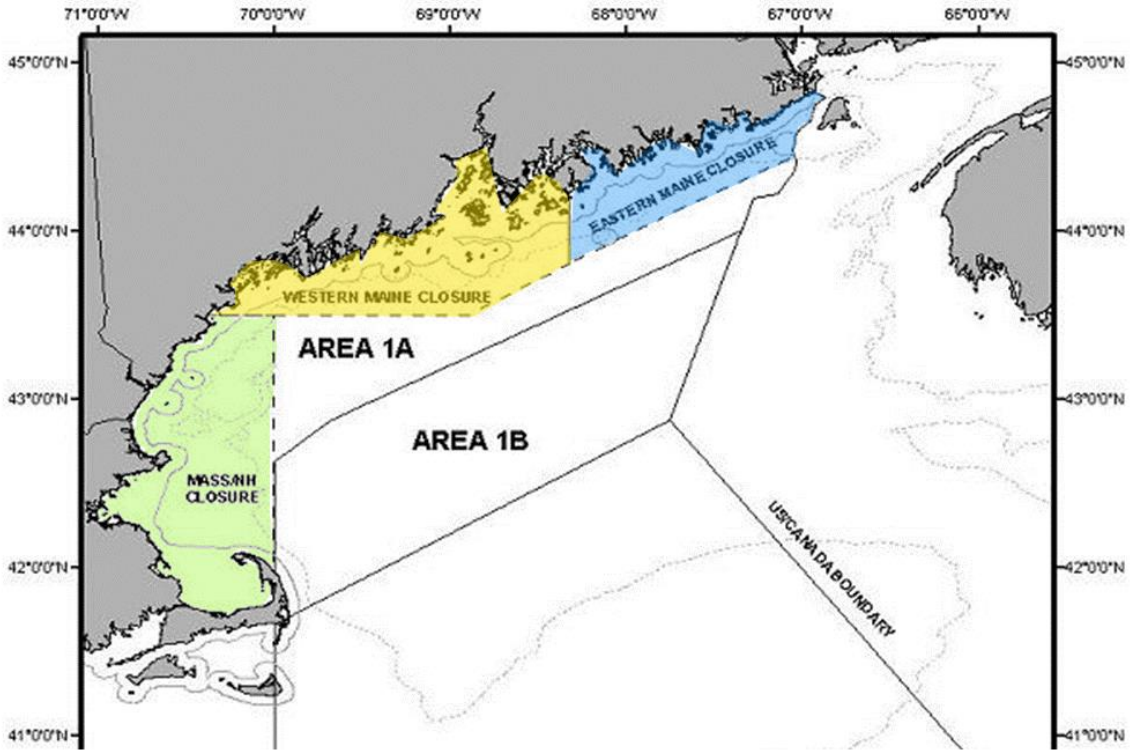


Figure 13. Current Spawning Area Boundaries, Same Area Shown in Figure 12 at a Closer Resolution



Option A. Status Quo

Maintain the spawning area boundaries (Figure 13):

Eastern Maine Spawning Area
All waters bounded by the following coordinates:

Maine coast	68º 20' W
43º 48' N	68º 20' W
44º 25' N	67º 03' W
North along US/Canada border	

Western Maine Spawning Area
All waters bounded by the following coordinates:

43º 30' N	Maine coast
43º 30' N	68º 54.5' W
43º 48' N	68º 20' W
North to Maine coast at 68º 20' W	

Massachusetts/New Hampshire Spawning Area
All waters bounded by the Massachusetts, New Hampshire and Maine coasts, and 43º 30' N and 70º 00' W

Option B. Combine the WM and MA/NH spawning areas into a Tri-State spawning area (WM-MA-NH) (Figure 14)

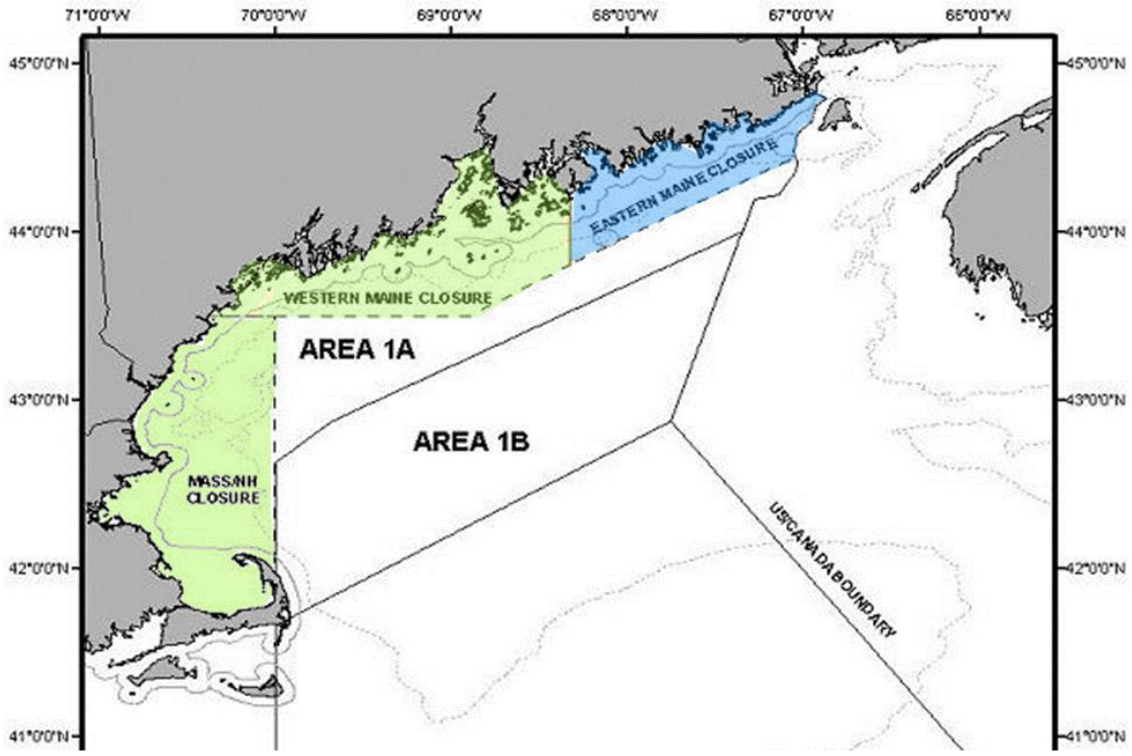
Eastern Maine Spawning Area
All waters bounded by the following coordinates:

Maine coast 68º 20' W
43º 48' N 68º 20' W
44º 25' N 67º 03' W
North along US/Canada border

Tri-State (WM-MA-NH)
All waters bounded by the Massachusetts, New Hampshire and Maine coasts, and:

Cape Cod north to 43º 30' N and 70º 00' W
43º 30' N 68º 54.5' W
43º 48' N 68º 20' W
North to Maine coast at 68º 20' W

Figure 14. Proposed Spawning Area Boundaries, EM and Tri-State (WM-MA-NH)



4.2.6.4 Spawning Closure Period

It has become evident the current GSI observations are not particularly useful for describing the duration of the spawning period because fishery-dependent (or commercial catch) samples are not available after the start of the closure. Several earlier studies in the GOM concur that the typical duration of herring spawning within a particular area is approximately 40 days. It is fairly common to find spawning herring in fishery samples after the initial four week closure. Therefore, it appears the current 4-week closure period is inadequate given the goals and objectives of this management action. Increasing to a 6-week closure (42 days) would provide a better match for the available information on the duration of GOM herring spawning.

Analysis of GSI data from 2004-2013 suggest larger fish spawn earlier than smaller fish. This finding is corroborated by studies documenting a size-dependent maturation process (Boyar 1968; Ware and Tanasichuk, 1989; Oskarsson et al., 2002; Slotte et al., 2000). As the age structure of the herring resource expands with the recovery, it is possible spawning events will lengthen.

CLOSURE PERIOD
Option A: Status Quo
By default, all spawning closures in all spawning areas selected under *Section 4.2.6.3* will last four (4) weeks.

Option B: Six Week Spawning Closure
By default, all spawning closures in all spawning areas selected under *Section 4.2.6.3* will last six (6) weeks.

RE-CLOSURE PROTOCOL
Option A: Status Quo
Catch sampling of the fishery will resume at the end of the initial four-week closure period. If catch sampling indicates significant numbers of spawn herring are still being harvested, closures will resume for an additional two weeks. Significant numbers of spawn herring is defined as 25% or more mature herring, by number in a catch sample, have yet to spawn. Mature or "spawn" herring are defined as Atlantic herring in ICNAF gonadal stages V and VI.

Option B: Defined Protocol
Sampling will resume in the final week of the initial closure period or at the end of the initial closure period. If one (1) sample taken from within a spawning closure area, by Maine, New Hampshire or Massachusetts, indicates significant numbers of spawn herring then closures will resume for an additional two (2) weeks. Significant numbers of spawn herring is defined as 25% or more mature herring, by number in a sample, have yet to spawn. Mature or "spawn" herring are defined as Atlantic herring in ICNAF gonadal stages V and VI. Sample is defined as a minimum of 100 randomly selected adult sized fish from a fishery dependent or independent source.

Option C: No Re-Closure Protocol
Samples will not be collected at the end of an initial closure period to inform the possibility of a re-closure.

4.2.6.5 Tolerance Provision – Zero Tolerance

Any vessel is prohibited to fish for, take, land, or possess herring from or within a restricted spawning area. Vessels are permitted to transit the restricted spawning areas with herring on board provided they comply with the provisions listed in the following two paragraphs.

Any vessel may fish for, take, land, or possess "spawn" herring from a management area outside of those identified in the Delineation of Spawning Areas. Any herring vessel having onboard spawn herring, which were caught outside of a management area that is under a herring spawning closure, may transit the closed area only if all of its fishing gear has been stowed. "Spawn" herring shall be identified as Atlantic herring in ICNAF gonadal stages V and VI.

An incidental bycatch allowance of up to 2,000 pounds of herring per trip for nondirected fisheries shall be in place during the spawning closures. This bycatch allowance will not be subject to the tolerance provision (i.e. vessels may land "spawn" herring as long as said vessel lands no more than 2,000 pounds). The amount of herring landed by one vessel in a day, as a bycatch allowance, shall not exceed 2,000 pounds (this prohibits a vessel from making multiple trips in one day to land more than the bycatch allowance). A trip shall be based on a calendar day basis.

4.2.6.6 Bycatch Allowance—Spawning Area Closure

No directed fisheries for Atlantic herring shall be allowed in a management area subject to a spawning closure. A bycatch allowance of up to 2,000 pounds of herring per trip for nondirected fisheries shall be in place during the spawning closures. The amount of herring landed by one vessel in a day, as a bycatch allowance, shall not exceed 2,000 pounds (this prohibits a vessel from making multiple trips in one day to land more than the bycatch allowance). A trip shall be based on a calendar day basis.

Any herring vessel transiting a management area that is under a herring spawning closure must have all of its fishing gear stowed.

4.2.6.7 Other Spawning Area Considerations—Exemption for East of Cutler Fixed Gear Fisheries

Under Amendment 1, all vessels fishing with fixed gear in state waters were required to obtain a permit from the appropriate state agency. While Amendment 1 did not specify an exemption for the fixed gear fisheries in the East Cutler area, these fisheries did have an exemption from the spawning restrictions prior to the amendment. The exemption was granted by the State of Maine and was later removed to comply with Amendment 1 to the Interstate FMP. The East Cutler area is defined in Figure 15 and 16. With implementation of Amendment 2 and 3, East of Cutler fixed

gear fisheries are granted an exemption from spawning area considerations and are not limited on the amount of spawn herring that can be landed during a spawning closure.

4.2.7 Fixed Gear Fisheries

4.2.7.1 Downeast Maine Fixed Gear Fisheries

A vast majority, if not all, of fixed gear fishermen operate in state waters and obtain state permits to fish for Atlantic herring. It is difficult to get an estimate of the number of fixed gear fishermen targeting Atlantic herring in each state because permitting requirements vary by state. Several of the states do not have species-specific permits; rather, permitting is tied to gear type or individual.

The catch from the Downeast Maine fixed gear fishery will be included as part of the assumed catch from the New Brunswick (NB) weir fishery when determining area-specific TACs and herring fishery specifications. During the fishing season, catch from the Downeast Maine fixed gear fishery will not be counted against the TAC for Area 1A, and the fixed gear fishery will be allowed to continue to operate once the Area 1A TAC has been reached. This equates to an exemption for the Downeast Maine fixed gear fishery from the Area 1A TAC. Total catch in the Downeast Maine fixed gear fishery would essentially be unrestricted (with the notable exception of inshore spawning restrictions that affect catch in this fishery).

Fixed gear fishermen that qualify for the exemption must report landings weekly through the federal interactive voice reporting (IVR) system to monitor total landings (New Brunswick plus Downeast Maine), as well as report landings monthly to ME DMR. The 2016-2018 specifications estimate the NB weir fishery annual catch to be 6,200 mt; this amount is deducted from the ABC. If the exempted landings increase significantly, modifications to the exemption may be necessary. The rationale for this measure is based on the proximity between the Downeast Maine fixed gear fishery and the fixed gear fishery occurring in New Brunswick. Both fisheries operate very close to each other and catch the same fish if/when they move inshore. If the Area 1A TAC is reached by the time the fish move inshore, then the Downeast Maine fixed gear fishermen lose access to the fishery, but the New Brunswick weir fishermen (only about 20 miles away) continue to catch the fish.

From 2005-2014, the New Brunswick weir fishery average catch was 9,100 mt, greatly reduced from the 1993-2002, average catch of 19,605 mt (Table 7). The New Brunswick weir fishery is not restricted by TACs in Canada, and landings from this fishery could increase in the future. With implementation of this measure, an adaptive approach may be necessary in the future so that the previous year's catch in these two fisheries could be accounted for when calculating TACs for the following year, especially if average catch in either the New Brunswick weir fishery or the Downeast Maine fixed gear fishery increases.

In addition to including catch from the Downeast Maine fixed gear fishery east of Cutler as part of the assumed catch from the New Brunswick (NB) weir fishery, up to 500 mt of the Area 1A sub-ACL, will be set aside for fixed gear fisheries operating in Area 1A (weirs and stop seines) west of Cutler (area west of the shaded area in Figure 15 and 16), see *Section 4.2.7.2 for details*.

In summary, the sub-ACL set-aside applies to the fixed gear fisheries occurring in Area 1A west of Cutler. The fixed gear fishery occurring east of Cutler will be exempt from the Area 1A sub-ACL. Both are required to report herring catch through IVR.

The definition of the Downeast Maine fixed gear fishery to which the above management measures apply is based on the definition used by the State of Maine in 1999 to establish an exemption for the Downeast Maine fixed gear fishery to spawning area restrictions:

Fixed gear (stop seine and weir) catches in waters north of a line drawn from Spruce Point (44 36.2' and 67 16.8'), Cross Island, Cutler, due east magnetic to the international boundary with Canada (see Figures 15 and 16).

Figure 15. Downeast Maine Fixed Gear Exemption Area (shaded area)

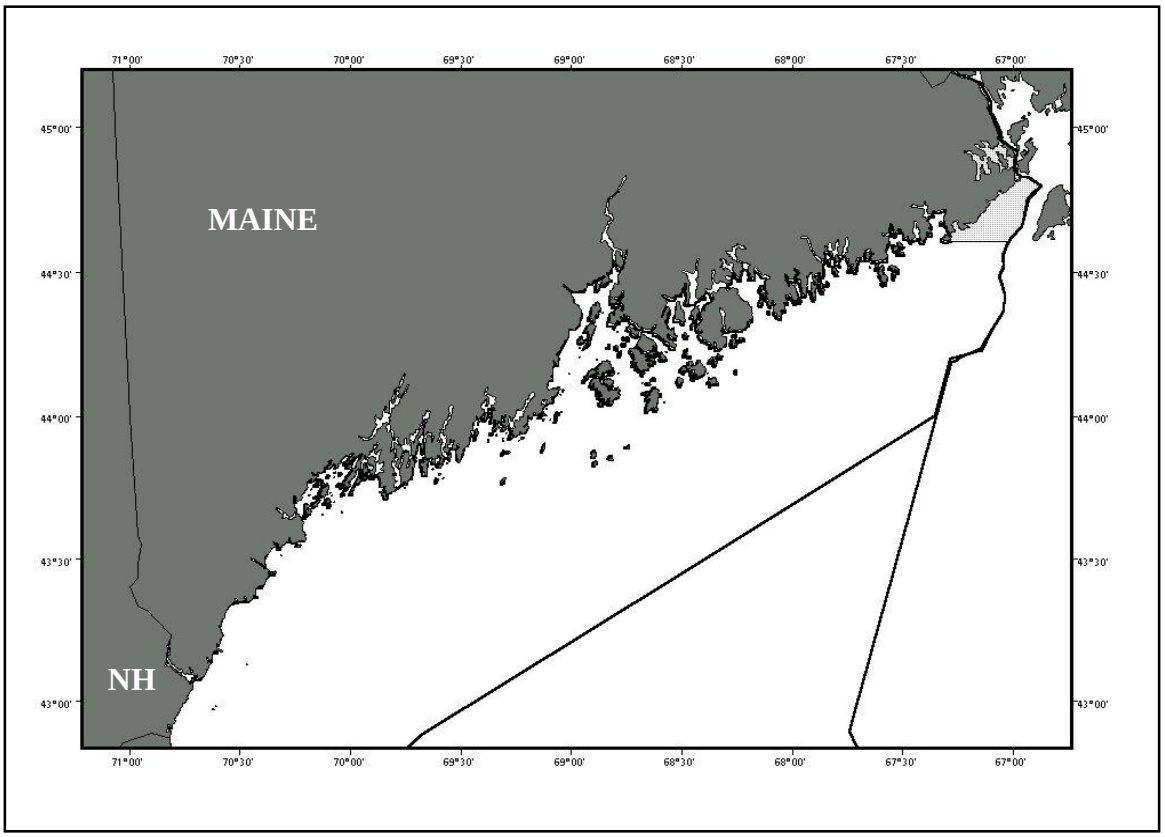


Figure 16. Downeast Maine Fixed Gear Exemption Area (shaded), same area defined in Figure 15 at a closer resolution

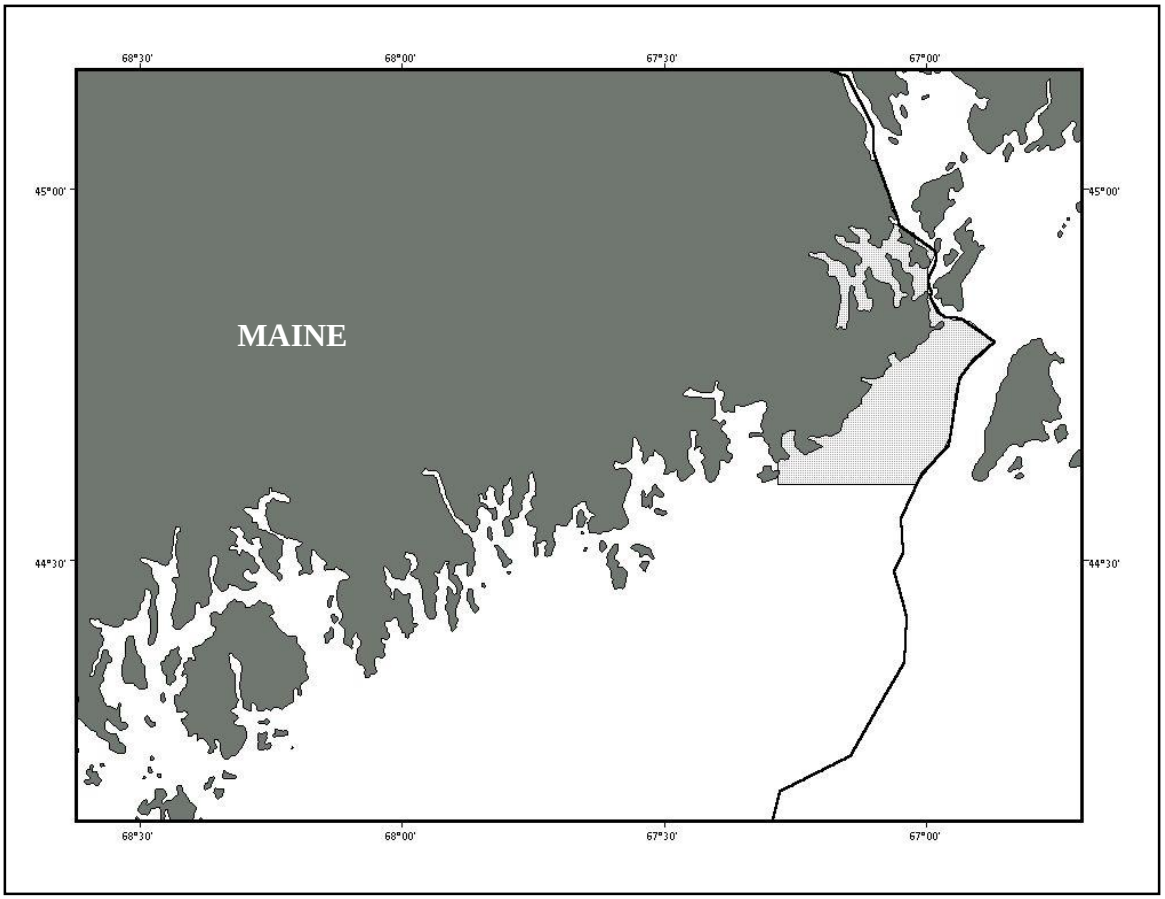


Table 7. Number of Active Weirs and Catch per Weir in the NB Weir Fishery, 1978-2014

Year	NB Weir Catch (mt)	No. Active Weirs	Catch Per Weir (mt)
1978	33,570	208	162
1979	32,477	210	155
1980	11,100	120	92
1981	15,575	147	102
1982	22,183	159	140
1983	10,594	143	88
1984	8,374	116	72
1985	26,724	156	171
1986	27,515	105	262
1987	26,622	123	216
1988	32,554	191	200
1989	43,475	171	255
1990	38,224	154	258
1991	23,713	143	166
1992	31,899	151	212
1993	31,431	145	216
1994	20,622	129	160
1995	18,198	106	172
1996	15,781	101	156
1997	20,416	102	200
1998	19,113	108	181
1999	18,234	100	191
2000	16,472	77	213
2001	20,064	101	199
2002	11,807	83	142
2003	9,003	78	115
2004	20,620	84	245
2005	12,639	76	166
2006	11,641	89	131
2007	30,145	97	311
2008	6,041	76	79
2009	3,603	38	95
2010	10,671	77	139
2011	2,643	37	71
2012	494	4	124
2013	5,902	49	120
2014	1,571	26	60

4.2.7.2 Fixed Gear Set-Aside Provision Adjustment

Fixed gear fisheries (weirs and stop seines) operating in Area 1A west of Cutler (area west of the shaded area in Figure 15 and 16) have a fixed gear set-aside (FGSA), up to 500 metric tons of the Area 1A sub-ACL, until November 1, after which it will be made available to the remainder of the herring fleet fishing in Area 1A until the directed fishery in Area 1A closes. The 2016-2018 specifications set the FGSA at 295 MT.

In recent years, Atlantic herring has been known to occur along the mid-coast of Maine through November. Fixed-gear fishermen have requested to remove the rollover date, thereby maintaining access to a dedicated quota for the fixed gear fishery after November 1. Fishermen expect a demand for bait in the lobster fishery through end of the year.

Historically, the fish have migrated away from the GOM coast by November. In the past decade, fixed gear landings have not fully utilized the FGSA (e.g., utilization over a 10-year average is 197.4 mt, or 67% of the set-aside) and landings after November 1 have been 0 mt since 1993 (Table 8).

The PDT noted, should fixed-gear fishermen exceed the FGSA, they have access to the total Area 1A sub-quota. There is no biological basis for or against adjusting the rollover provision of the fixed-gear set aside, but there may be socioeconomic reasons. In addition, if the rollover provision is changed then there will be inconsistent set aside measures between state and federal rules.

Table 8. Atlantic Herring Landings from Fixed Gear Fishery (Stop Seine, Weir, Pound Net) Before and After November 1 Rollover Date

Year	Sub-ACL Closure Date	Area 1A Sub-ACL (mt)	Cumulative Catch (mt) by Dec 31	Fixed Gear Landings (mt)	
				Jan-Oct	Nov-Dec
2004	11/19/2004	60,000	60,071	49	0
2005	12/2/2005	60,000	61,570	53	0
2006	10/21/2006	50,000	59,980	528	0
2007	10/25/2007	50,000	49,992	392	0
2008	11/14/2008	43,650	42,257	24	0
2009	11/26/2009	43,650	44,088	81	0
2010	11/17/2010	26,546	27,741	823	0
2011	10/27/2011	29,251	29,359	23	0
2012	11/5/2012	27,668	25,057	0	0
2013	10/15/2013	29,775	29,820	C	C
2014	10/26/2014	33,031	33,428	C	C

Note: "C" denotes that the value cannot be reported due to confidentiality.

Option A: Status Quo
The fixed gear set-aside will be available to fixed gear fishermen in Area 1A until November 1. If the set-aside has not been utilized by the fixed gear fisheries west of Cutler by November 1, it will then be made available to the remainder of the herring fleet fishing in Area 1A until the directed fishery in 1A closes. *Fixed gear fishermen can continue fishing and landings will count towards the Area 1A sub-quota.* If 92% of the Area 1A TAC has already been reached by November 1 (and the directed herring fishery in 1A is therefore closed), the set-aside will be released as part of the 5% set-aside for incidental catch in 1A (at a 2,000 lb trip limit).

Option B: Remove the rollover provision
The fixed gear set-aside will be available to fixed gear fishermen west of Cutler through December 31. When 92% of the Area 1A TAC has been reached, all directed Atlantic herring fisheries in Area 1A will closed. Unused portions of the fixed gear set-aside will not be rolled from one year to the next.

4.2.7.3 Small Scale Fixed Gear Fisheries

The Commission received public comments on fixed gear fisheries taking place in areas such as New Jersey and Massachusetts. These comments expressed concern regarding their ability to continue harvesting herring if a limited access program is implemented in state waters. The comments also emphasized a need for a consistent small supply of fresh herring throughout the year for various bait markets (lobster and striped bass) and ethnic markets for human consumption. These small-scale fixed gear fishermen need access to about 300-400 pounds of herring per day. As long as Amendment 3 continues the 2,000 pound bycatch provision during closures, these smaller scale fixed gear fishermen should continue to have access to the resource and have the ability to harvest enough herring to supply these markets.

4.2.8 Empty Fish Hold Provision

Currently, the interstate and federal Atlantic Herring FMPs do not require an empty fish hold prior to departing the dock. However, there is concern that unsold herring are dumped at sea if there is not enough market demand for the resource. Additionally, fish from multiple trips can be mixed if the holds are not completely emptied—this has the potential to compromise landings data used to inform harvest control measures and bycatch avoidance programs, particularly for river herring. Furthermore, leaving fish in the vessel's hold prevents portside samplers from observing the entire catch.

The New England Fishery Management Council (NEFMC), in Draft Framework Adjustment 4, approved a requirement for vessel holds to be empty of fish prior to leaving a dock. The Council adopted *Alternative 2.1.2, Alternative 2, Option C in Framework 4*, which includes that a waiver may be issued for instances when there are fish in the holds after inspection by an appropriate law enforcement officer. The Council's alternative would only apply to Category A (All Area Limited Access) and B (Areas 2/3 Limited Access) vessels. The intent is for waivers to be issued

for refrigeration failure and non-marketable reported fish. Options B1 and B2, below, match the NEFMC preferred option.

This is currently a proposed rule to the federal FMP. NMFS will be need to approve Framework Adjustment 4 for this to become effective federally. The Section could select Option B2 or C2, and then it would be the states responsibility to implement the empty fish hold provision, regardless of federal adoption.

The PDT included Options C1 and C2 to account for vessels with freezing capability, which commonly unload only when the freezer is full, and do not utilize pumps—these vessels would be exempt from the provision.

Option A: Status Quo
No empty fish hold provision. There is no requirement to empty vessel holds of fish prior to a fishing trip departure.

Option B1: Federal/State Empty Fish Hold Provision
The language in this Option mirrors the provision in Framework Adjustment 4 and is contingent on federal option. Meaning if NMFS adopts Framework Adjustment 4 then the states will implement this option.

This option would require that fish holds on Category A/B Atlantic herring vessels are empty of fish before leaving the dock on any trip when declared into the Atlantic herring fishery. A waiver may be issued for instances when there are fish in the hold after inspection by an appropriate law enforcement officer (the intent is for waivers to be issued for refrigeration failure and non-marketable fish that have been reported by the vessel). Only vessels departing on a fishing trip (i.e. declared into the fishery) are required to have holds empty of fish. As such, waivers would not be required for vessels transporting fish from dock to dock.

Option B2: State Empty Fish Hold Provision
This option is the same as B1, but it is NOT contingent on federal adoption. Meaning if NMFS does not adopt Framework Adjustment 4 then the states can still implement this option.

Option C1: Federal/State Empty Fish Hold Provision for Select Vessels
This option is similar to Option B1, with the additional underlined text, and is contingent on federal adoption. Meaning if NMFS adopts Framework Adjustment 4 then the states will implement this option instead.

This option would require that fish holds on Category A/B Atlantic herring vessels <u>with ability to pump fish</u> are empty of fish before leaving the dock on any trip when declared into the Atlantic herring fishery. A waiver may be issued for instances when there are <u>a pumpable quantity of</u> fish in the hold as determined by an appropriate law enforcement officer (the intent is for waivers to be issued for refrigeration failure and non-marketable fish that have been reported by the vessel). Only vessels departing on a fishing trip (i.e.

declared into the fishery) are required to have holds empty of fish. As such, waivers would not be required for vessels transporting fish from dock to dock.

Option C2: State Empty Fish Hold Provision for Select Vessels
This option is the same as C1, but it is NOT contingent on federal adoption. Meaning if NMFS does not adopt Framework Adjustment 4 then the states can still implement this option.

4.2.9 Use restrictions – Prohibition of Directed Mealing

The harvest of herring for the primary purpose of reduction to meal or meal-like product is prohibited. The processing, transfer, or sale of herring cuttings, by-products, and whole herring condemned for human consumption, or waste is permitted.

The harvest of herring for the primary purpose of reduction to fishmeal or oil is a concern because of the large volume of fish necessary to support such an operation. The rapid harvest may make it difficult to track landings and implement effort controls at the appropriate time. This may lead to the ACL being exceeded. Even if effort controls can be implemented in a timely fashion, a rapid harvest could lead to an early closure of the fishery, disrupting the supply of herring to other markets.

4.2.10 Internal Water Processing – Prohibition of IWPs in All State Waters

Due to the uncertainty in the inshore stock status, overcapacity in Area 1 and sufficient access to the domestic shoreside processing plants in Area 1, Internal Water Processing operations will be prohibited from processing herring caught in all state waters.

4.3 HABITAT CONSERVATION AND RESTORATION

4.3.1 Preservation of Existing Habitat

Protection of habitat essential for herring spawning is vital to ensure the continued recovery and health of this species. States should identify any locations where herring consistently return to spawn in order to provide some protective measures to egg beds when and if necessary. Monitoring of these locations may also provide an indication of relative spawning component size.

4.3.2 Habitat Restoration, Improvement, and Enhancement

1. State marine fisheries agencies should identify state permitting and planning agencies, which regulate those activities likely to adversely affect Essential Fish Habitat (EFH) and habitats, either by destruction of habitat or degradation of quality. The marine fisheries agency should work with the relevant permitting or planning agency in each state to develop permit conditions and planning considerations to avoid or mitigate adverse impacts on EFH. Standard permit conditions and model policies that contain mitigation techniques should be developed. The development of Memoranda of Understanding (MOU's) with other state

agencies are recommended for joint review of projects and planning activities to ensure that habitat protections are adequately incorporated.

For example, dredging windows should be established to avoid impacts to Atlantic herring egg EFH and spawning activity. Dredging windows should be coordinated to ensure practical opportunities for permitted dredging to take place.

2. When it is expected that impacts will occur from an anthropogenic activity, but probably not above some *de minimis* level, prohibition of the activity may not be warranted, but the marine fisheries agency should request that the appropriate agency consider requiring application of Best Management Practices for the activity.

3. State marine fisheries agencies should coordinate with state water quality agencies and state coastal zone management agencies to ensure that Clean Water Act Section 319 non-point source control plans and Coastal Zone Act Reauthorization Amendment Section 6217 coastal non-point source control plans are developed and implemented so as to minimize adverse impacts of non-point source pollution on herring and herring EFH. In particular, marine fisheries agencies should consider whether areas such as EFH for eggs merit designation as critical coastal areas under state 6217 programs (non-point source pollution control under the Coastal Zone Management Act amendments of 1990) due to water quality impacts to fish habitat, and should provide input to the 6217 lead agencies (identified in the Source Document).

4. State marine fisheries agencies should coordinate with appropriate state agencies to strengthen compliance with National Pollutant Discharge Elimination System (NPDES) or State Pollutant Discharge Elimination System (SPDES) permits.

5. State marine fisheries agencies should work with state coastal zone management agencies to determine whether: 1) additional state policies for habitat protection should be adopted under the state coastal management program; 2) additional federal activities should be added to the state coastal management programs list of activities subject to state consistency review; and 3) the state is fully utilizing the Coastal Zone Management Act federal consistency process for protection of fish habitats.

6. When states have identified habitat restoration as a need, state marine fisheries agencies should coordinate with other agencies to ensure that habitat restoration plans are developed, and funding is actively sought for plan implementation and monitoring.

7. State marine fisheries agencies should coordinate with and provide input to the state water quality agency in development and updating of the Clean Water Act section 303(d) list (priority list of water not meeting state water quality standards). In addition, state marine fisheries agencies should review the adequacy of water quality standards to protect herring and should participate in the triennial review of the state water quality standards.

8. State marine fisheries agencies should review oil spill prevention and response plans for preventing accidental release and recommending prioritized response in EFH.

9. State marine fisheries agencies should work closely with the appropriate Coast Guard District Office in the development, amendment, and implementation of area wide oil spill contingency plans.

10. State marine fisheries agencies should work closely with water quality agencies in the development or revision of river basin plans to identify degraded or threatened resources and recommend preventative, remedial or mitigation measures.

11. State marine fisheries agencies should work with the appropriate agencies to develop contaminated sediment remediation plans or active sediment pollution prevention programs for areas with or susceptible to sediment contamination.

12. State marine fisheries agencies should coordinate with appropriate National Estuary Program (NEP) committees to ensure that NEP Comprehensive Coastal Management Plans (CCMPs) identify and implement habitat protection and restoration needs.

State marine fisheries agencies should assist industrial siting councils in siting new power plants so that impingement and entrainment of Atlantic herring are minimized.

State marine fisheries agencies should work with the appropriate agencies to establish and enforce "no discharge" zones, and promote education of recreational boaters to reduce contamination of nearshore waters from chronic fuel spills and waste disposal.

4.3.3 Avoidance of Incompatible Activities

Federal and state fishery management agencies should take steps to limit the introduction of compounds that are known or suspected to accumulate in Atlantic herring tissue and which pose a threat to human health or Atlantic herring health. Each state should establish windows of compatibility for activities known or suspected to adversely affect herring life stages and their habitats (such as navigational dredging, bridge construction, and dredged material disposal) and notify the appropriate construction or regulatory agencies in writing. Projects involving water withdrawal from spawning or nursery habitats (e.g. power plants, irrigation, water supply projects) should be scrutinized to ensure that adverse impacts resulting from larval/ juvenile impingement, entrainment, and/or modification of flow, temperature and salinity regimes due to water removal will not adversely impact Atlantic sturgeon spawning stocks, including early life stages. Each state which contains spawning and nursery areas within its jurisdiction should develop water use and flow regime guidelines which are protective of Atlantic sturgeon spawning and nursery areas and which will ensure to the extent possible the long-term health and sustainability of the stock. States should endeavor to ensure that proposed water diversions/withdrawals from rivers tributary to spawning and nursery habitats will not reduce or eliminate conditions favorable to Atlantic herring use of these habitats.

4.3.4 Fisheries Practices

The use of any fishing gear or practice which is documented by management agencies to have an unacceptable impact on Atlantic herring (e.g. habitat damage or bycatch mortality) should be prohibited within the effected essential habitats (e.g. trawling in spawning areas or primary nursery areas should be prohibited).

4.4 ALTERNATIVE STATE MANAGEMENT REGIMES

Once approved by the Atlantic Herring Management Section, states are required to obtain prior approval from the Section of any changes to their management program for which a compliance requirement is in effect. Other non-compliance measures must be reported to the Section but may be implemented without prior approval from the Section. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Section's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.5*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Section and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

4.4.1 General Procedures

A state may submit a proposal for a change to its regulatory program or any mandatory compliance measure under this amendment to the Commission, including a proposal for *de minimis* status. Such changes shall be submitted to the Chair of the Plan Review Team, who shall distribute the proposal to the Management Section, the Plan Review Team, the Technical Committee, the Stock Assessment Committee and the Advisory Panel.

The Plan Review Team is responsible for gathering the comments of the Technical Committee, the Stock Assessment Committee and the Advisory Panel, and presenting these comments as soon as possible to the Section for decision.

The Atlantic Herring Section will decide to approve the state proposal for an alternative management program if it is consistent with the applicable target fishing mortality rate and the goals and objectives of this amendment.

4.4.2 Management Program Equivalency

The Atlantic Herring Technical Committee, under the direction of the Plan Review Team, will review any alternative state proposals under this section and provide to the Atlantic Herring Management Section its evaluation of the adequacy of such proposals.

4.4.3 *De Minimis* Fishery Guidelines

The ASMFC Interstate Fisheries Management Program Charter defines *de minimis* as "a situation in which, under the existing condition of the stock and scope of the fishery, conservation and enforcement actions taken by an individual state would be expected to contribute insignificantly to a coastwide conservation program required by a Fishery Management Plan or amendment" (ASMFC, 2000).

States may apply for *de minimis* status if, for the last *three* years, the combined average commercial landings (by weight) constitute less than one percent (1%) of the coastwide commercial landings for the same *three*-year period. States may petition the Atlantic Herring Section at any time for *de minimis* status, if their fishery falls below the threshold level. Once *de minimis* status is granted, designated states must submit annual reports to the Section justifying the continuance of *de minimis* status. States are encouraged to include *de minimis* requests as part of their annual compliance reports.

4.5 ADAPTIVE MANAGEMENT

The Atlantic Herring Section may vary the requirements specified in this amendment as a part of adaptive management in order to conserve the Atlantic herring resource. Specifically, the Section may change target fishing mortality rates and harvest specifications, other measures designed to prevent overfishing of the stock complex or any spawning component. Such changes will be instituted to be effective on the first fishing day of the following year, but may be put in place at an alternative time when deemed necessary by the Section. These changes should be discussed with the appropriate federal representatives and Councils prior to implementation in order to be complementary to the regulations for the EEZ.

4.5.1 General Procedures

The Plan Review Team will monitor the status of the fishery and the resource and report on that status to the Atlantic Herring Management Section annually, or when directed to do so by the Section. The Plan Review Team will consult with the Technical Committee, the Stock Assessment Committee and the Advisory Panel, if any, in making such review and report. The report will contain recommendations concerning proposed adaptive management revisions to the management program.

The Atlantic Herring Management Section will review the report of the Plan Review Team and may consult further with Technical Committee, the Stock Assessment Committee or the Advisory Panel. The Section may direct the PRT to prepare an addendum to make any changes it deems necessary. The addendum shall contain a schedule for the states to implement its provisions.

The Plan Review Team will prepare a draft addendum as directed by the Section and shall distribute it to all states for review and comment. A public hearing will be held in any state that requests one. The Plan Review Team will also request comment from federal agencies and the public at large. After a 30-day review period, the Plan Review Team will summarize the comments and prepare a final version of the addendum for the Management Section.

The Management Section shall review the final version of the addendum prepared by the Plan Review Team and shall also consider the public comments received and the recommendations of the Technical Committee, the Stock Assessment Committee and the Advisory Panel. The Section shall then decide whether to adopt, or revise and then adopt, the addendum.

Upon adoption of an addendum implementing adaptive management by the Section, states shall prepare plans to carry out the addendum, and submit them to the Section for approval according to the schedule contained in the addendum.

4.5.2 Measures Subject to Change

The following measures are subject to change under adaptive management upon approval by the Atlantic Herring Section:

1. MSY or MSY proxy;
2. Management area boundaries or additional management areas;
3. Size, timing, or location of a new or existing spawning area closure;
4. Closed area other than a spawning closure;
5. Restrictions in the amount of fishing time;
6. Days at sea system, including options transferability or leasing of DAS;
7. Adjustments to OY, TACs, DAP, DAH, JVP, IWP, or the Reserve;
8. Adjustments to the amount of Canadian catch deducted when determining specifications;
9. Distribution of the TAC to an area or time period;
10. Gear restrictions (such as *gear type*, mesh size, etc.) or requirements (such as bycatch reduction devices, etc.);
11. Measures to address bycatch and bycatch monitoring (such as seasonal, and temporal closures, bycatch caps, gear restriction, and closed fishing seasons);
12. Vessel size/horsepower restrictions; vessel size limits/upgrade restrictions
13. Closed seasons;
14. Minimum fish size;
15. Trip limits;
16. Seasonal or area quotas; seasonal allocation of area TACs
17. In-season adjustments;
18. Changes to the overfishing definition;
19. Vessel tracking system;
20. Restrictions for prohibitions on mealing or a roe fishery;
21. Quota monitoring tools, such as vessel operator or dealer reporting requirements;
22. Permit upgrading or splitting limitations, and vessel upgrading restrictions;
23. Measures to reduce gear conflicts, such as:
24. Mandatory monitoring of a radio channel by fishing vessels;
25. Gear location reporting by fixed gear fishermen and mandatory plotting by mobile gear fishermen;
26. Standards of operation when gear conflicts occur;

27. Fixed gear marking or setting practices;
28. Gear restrictions for certain areas and/or at certain times of the year;
29. Vessel monitoring systems;
30. Restrictions on the maximum number of fishing vessels;
31. Special permitting conditions;
32. Measures to address information from multispecies stock assessments;
33. Management of the roe fishery
34. Herring Processor Survey
35. Sector allocation/effort control
36. Any other management measures currently included in Amendment 3.

4.6 EMERGENCY PROCEDURES

Emergency procedures may be used by the Atlantic Herring Section to require any emergency action that is not covered by or is an exception or change to any provision in Amendment 3. Procedures for implementation are addressed in the ASMFC Interstate Fisheries Management Program Charter, Section Six (c)(10) (ASMFC, 2000).

4.7 MANAGEMENT INSTITUTIONS

The management institutions for Atlantic herring shall be subject to the provisions of the ISFMP Charter (ASMFC, 2000). The following is not intended to replace any or all of the provisions of the ISFMP Charter. All committee roles and responsibilities are included in detail in the ISFMP Charter and are only summarized here.

4.7.1 ASMFC and the ISFMP Policy Board

The ASMFC (Commission) and the ISFMP Policy Board are generally responsible for the oversight and management of the Commission's fisheries management activities. The Commission must approve all fishery management plans, and amendments, including this Amendment 3, and must also make all final determinations concerning state compliance or noncompliance. The ISFMP Policy Board reviews any non-compliance recommendations of the various Management Boards and Sections and, if it concurs, forwards them on to the Commission for action.

4.7.2 Atlantic Herring Section

The Atlantic Herring Section is established by Amendment 1 to the Compact creating the Commission (Public Law 539, as amended) and is generally responsible for carrying out all activities under this Amendment. It establishes and oversees the activities of the Plan Development or Plan Review Team, the Technical Committee and the Stock Assessment Subcommittee and requests the establishment of the Commission's Atlantic Herring Advisory Panel. Among other things, the Section makes changes to the management program under adaptive management and approves state programs implementing the amendment and alternative state programs under *Sections 4.5*. The Section reviews the status of state compliance with the

FMP or amendment at least annually. If it determines that a state is out of compliance, the Section reports its determination to the ISFMP Policy Board under the terms of the ISFMP Charter.

4.7.3 Atlantic Herring Plan Development / Plan Review Team

The Atlantic Herring Plan Development Team (PDT) and the Atlantic Herring Plan Review Team (PRT) will be composed of a small group of scientists and/or managers whose responsibility is to provide all of the technical support necessary to carry out and document the decisions of the Atlantic Herring Management Section. The ASMFC FMP Coordinator chairs both. The Atlantic Herring PDT/PRT is directly responsible to the Section for providing information and documentation concerning the implementation, review, monitoring and enforcement of Amendment 3. The Atlantic Herring PDT/PRT shall be comprised of personnel from state and federal agencies who have scientific and management ability and knowledge of Atlantic herring. The PDT will be responsible for preparing all documentation necessary for the development of Amendment 3, using the best scientific information available and the most current stock assessment information. The PDT will either disband or assume inactive status upon completion of Amendment 3. Alternatively, the Section may elect to retain PDT members as members of the PRT or appoint new members. The PRT will provide annual advice concerning the implementation, review, monitoring, and enforcement of Amendment 3 once the Commission has adopted it.

4.7.4 Atlantic Herring Technical Committee

The Atlantic Herring Technical Committee will consist of representatives from state or federal agencies, Regional Fishery Management Councils, Commission, university or other specialized personnel with scientific and technical expertise and knowledge of the Atlantic herring fishery. The Section will appoint the members of the Technical Committee and may authorize additional seats as it sees fit. Its role is to act as a liaison to the individual state and federal agencies, provide information to the management process, and review and develop options concerning the management program. The Technical Committee will provide scientific and technical advice to the Management Section, PDT and PRT in the development and monitoring of a fishery management plan or amendment.

4.7.5 Atlantic Herring Stock Assessment Subcommittee

The Atlantic Herring Stock Assessment Subcommittee shall be appointed by the Technical Committee at the request of the Section and will consist of scientists with expertise in the assessment of the Atlantic herring population. Its role is to assess the Atlantic herring population and provide scientific advice concerning the implications of proposed or potential management alternatives, or to respond to other scientific questions from the Section, Technical Committee, PDT or PRT. The Stock Assessment Subcommittee will report to the Technical Committee.

4.7.6 Atlantic Herring Advisory Panel

The Atlantic Herring Advisory Panel was established according to the Commission's Advisory Committee Charter. Members of the Advisory Panel are citizens who represent a cross-section of

commercial fishing interests and others who are concerned about Atlantic herring conservation and management. The Advisory Panel provides the Section with advice directly concerning the Commission's Atlantic herring management program.

4.8 FEDERAL AGENCIES

4.9.8.1 Management in the Exclusive Economic Zone (EEZ)

Management of Atlantic herring in the EEZ is currently under the jurisdiction of the New England Fishery Management Council under the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.). In the absence of a Council Fishery Management Plan, management is the responsibility of the NMFS as mandated by the Atlantic Coastal Fishery Conservation and Management Act (16 U.S.C. 5105 et seq.) and the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.). NEFMC began managing the herring fishery in 2006; management measures are currently encompassed in Amendment 5 to the herring FMP, published in 2013.

4.9.8.2 Federal Agency Participation in the Management Process

The Commission has accorded the United States Fish and Wildlife Service (USFWS) and the NMFS voting status on the ISFMP Policy Board in accordance with the Commission's ISFMP Charter. Due to the makeup of Sections under the ISFMP Charter, no federal agencies are accorded voting status on the Atlantic Herring Management Section; however, the NMFS participates on the Atlantic Herring Plan Development Team, Plan Review Team, Technical Committee and Stock Assessment Subcommittee.

4.9.8.3 Consultation with Fishery Management Councils

In carrying out the provisions of Amendment 3, the states, as members of the Atlantic Herring Section, shall closely coordinate with the New England Fishery Management Council in order to cooperatively manage the Atlantic herring population. In accordance with the Commission's ISFMP Charter, a representative of the New England Fishery Management Council may be invited to participate as a full member of the Atlantic Herring Section.

4.10 COOPERATION WITH OTHER MANAGEMENT INSTITUTIONS

The Atlantic Herring Plan Review Team, Technical Committee and Management Section shall regularly communicate with fishery managers in Canadian agencies to help ensure the sustainability of the Atlantic herring resource. Canadian fishery managers and their officials shall be invited to ASMFC discussions on Atlantic herring conservation as needed, especially when discussing transshipment issues and cross-border trade.

5.0 COMPLIANCE

Full implementation of the provisions of this amendment is necessary for the management program to be equitable, efficient and effective. States are expected to implement these measures faithfully under state laws. The Atlantic States Marine Fisheries Commission will continually monitor the effectiveness of state implementation and determine whether states are in compliance with the provisions of this fishery management plan. This section sets forth the specific elements states must implement in order to be in compliance with this fishery management plan, and the procedures that will govern the evaluation of compliance. Additional details of the procedures are found in the ASMFC Interstate Fisheries Management Program Charter (ASMFC, 2000).

5.1 MANDATORY COMPLIANCE ELEMENTS FOR STATES

A state will be determined to be out of compliance with the provisions of this fishery management plan, according to the terms of Section Seven of the ISFMP Charter if:

- its regulatory and management programs to implement *Section 4* have not been approved by the Atlantic Herring Section; or
- it fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under adaptive management (*Section 4.5*); or
- it has failed to implement a change to its program when determined necessary by the Atlantic Herring Section; or
- it makes a change to its regulations required under *Section 4* or any addendum prepared under adaptive management (*Section 4.5*) without prior approval of the Atlantic Herring Section.

5.1.1 Mandatory Elements of State Programs

To be considered in compliance with this fishery management plan, all state programs must include harvest controls/a regime of restrictions for Atlantic herring fisheries consistent with the requirements of *Sections 4.0*; except that a state may propose an alternative management program under *Section 4.5*, which, if approved by the Section, may be implemented as an alternative regulatory requirement for compliance.

In addition, the Atlantic Herring Section will monitor bycatch of Atlantic herring in other fisheries and report excessive bycatch problems to the management authority for the fishery causing the bycatch.

5.1.1.1 Regulatory Requirements

States may begin to implement Amendment 3 after final approval by the Commission. Each state must submit its required Atlantic herring regulatory program to the Commission through the ASMFC staff for approval by the Atlantic Herring Section. During the period from submission, until the Management Section makes a decision on a state's program, a state may not adopt a less protective management program than contained in this management plan or contained in current

state law. The following lists the specific compliance criteria that a state/jurisdiction must implement in order to be in compliance with Amendment 3:

> [TBD: Regulatory requirements to be set should the draft amendment be approved for implementation.]

Once approved by the Atlantic Herring Management Section, states are required to obtain prior approval from the Section of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Section but may be implemented without prior Section approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Section's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.5*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Section and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

5.1.1.2 Monitoring Requirements

The PDT and Technical Committee will work to develop appropriate protocols for designing fishery-independent surveys for Atlantic herring. Such surveys may be implemented under *Section 4.5* (Adaptive Management) through the Commission's addendum process including the opportunity for public comment.

5.1.1.3 Research Requirements

The PDT and Technical Committee will prioritize the research needs for Atlantic herring. Appropriate programs for meeting these needs may be implemented under *Section 4.5* (Adaptive Management) through the Commission's addendum process including the opportunity for public comment.

5.1.1.4 Law Enforcement Requirements

All state programs must include law enforcement capabilities adequate for successfully implementing that state's Atlantic herring regulations. The adequacy of a state's enforcement activity will be monitored annually by reports of the ASMFC Law Enforcement Committee to the Atlantic Herring Plan Review Team. The first reporting period will cover the period from January 1 – December 31.

5.1.1.5 Habitat Requirements

There are no mandatory habitat requirements for Atlantic herring. See *Section 4.3* for Habitat Recommendations.

5.1.2 Compliance Schedule

Reports on compliance must be submitted to the Commission by each jurisdiction annually, no later than *February 1*.

Each state must submit an annual report concerning its Atlantic herring fisheries and management program for the previous calendar year. A standard compliance report format has been prepared and adopted by the ISFMP Policy Board. States should follow the format provided when completing the annual compliance report.

5.2 PROCEDURES FOR DETERMINING COMPLIANCE

Detailed procedures regarding compliance determinations are contained in the ISFMP Charter, Section Seven (ASMFC, 2000). The following summary is not meant in any way to replace the language found in the ISFMP Charter.

In brief, all states are responsible for the full and effective implementation and enforcement of fishery management plans in areas subject to their jurisdiction. Written compliance reports as specified in the Plan or Amendment must be submitted annually by each state with a declared interest. Compliance with Amendment 3 will be reviewed at least annually. The Atlantic Herring Section, ISFMP Policy Board or the Commission, may request the Atlantic Herring Plan Review Team to conduct a review of plan implementation and compliance at any time.
The Atlantic Herring Section will review the written findings of the PRT within 60 days of receipt of a State's compliance report. Should the Section recommend to the Policy Board that a state be determined out of compliance, a rationale for the recommended non-compliance finding will be included addressing specifically the required measures of Amendment 3 that the state has not implemented or enforced, a statement of how failure to implement or enforce the required measures jeopardizes Atlantic herring conservation, and the actions a state must take in order to comply with Amendment 3 requirements.

The ISFMP Policy Board shall, within thirty days of receiving a recommendation of non-compliance from the Atlantic Herring Section, review that recommendation of non-compliance. If it concurs in the recommendation, it shall recommend at that time to the Commission that a state be found out of compliance.

The Commission shall consider any Amendment 3 non-compliance recommendation from the Policy Board within 30 days. Any state, which is the subject of a recommendation for a non-compliance finding is given an opportunity to present written and/or oral testimony concerning whether it should be found out of compliance. If the Commission agrees with the recommendation of the Policy Board, it may determine that a state is not in compliance with Amendment 3 and specify the actions the state must take to come into compliance.

Any state that has been determined to be out of compliance may request that the Commission rescind its non-compliance findings, provided the state has revised its Atlantic herring conservation measures or shown to the Board and/or Commission's satisfaction that actions taken by the state provide for conservation equivalency.

5.3 ANALYSIS OF ENFORCEABILITY OF PROPOSED MEASURES

The ASMFC Law Enforcement Committee will, during the implementation of this amendment, analyze the enforceability of new conservation and management measures as they are proposed.

6.0 MANAGEMENT AND RESEARCH NEEDS

During the development of this amendment, the Council, in conjunction with ASMFC as well as the Herring PDT and Advisory Panel, identified the following data and research needs. Addressing current data deficiencies will improve the long-term management of the Atlantic herring fishery.

6.1 STOCK ASSESSMENT AND POPULATION DYNAMICS

- Continue commercial catch sampling of Atlantic herring fishery according to ACCSP protocols
- Continue to utilize the inshore and offshore hydroacoustic and trawl surveys to provide an independent means of estimating stock sizes. Collaborative work between NMFS, DFO, State agencies and the herring industry on acoustic surveys for herring should continue to be encouraged.
- Develop tagging and morphometric studies to explore uncertainties in stock structure and the impacts of harvest mortality on different components of the stock. Although tagging studies may be problematic for assessing survivorship for a species like herring, they may be helpful in identifying the stock components and the proportion of these components taken in the fishery on a seasonal basis.
- Examine the root causes of the discrepancy between Forward Projection and ADAPT assessments.
- Pursue the development of a dedicated pelagic survey technique utilizing hydroacoustic and trawling methods to provide another direct and independent means of estimating stock sizes. Collaborative work between NMFS, DFO, State agencies and the herring industry on acoustic surveys for herring should be encouraged.
- Potential changes in catchability within spring bottom trawl survey indices should be investigated.
- Organize annual U.S.-Canada workshops to coordinate stock assessment activities and optimize cooperation in management approaches between the two countries.

6.1.1 Biology/Community Ecology

- Reinvestigate the estimation of age-3 herring, the natural mortality rate assumed for all ages, the use of catch-per-unit-effort tuning indices and the use of NEFSC fall bottom trawl survey tuning indices in the analytical assessment of herring.
- Evaluate the concept of a minimum biologically-acceptable level biomass (MBAL) for the herring coastal stock complex. Determine the adequacy of present methods and data to determine MBAL if appropriate.

- Possible effects of density-dependence (e.g. reduced growth rates at high population size) on parameter estimates used in assessments should be examined.
- Synthesize predator/prey information and conduct investigations to address information gaps; investigate the role of herring in the Northwest Atlantic ecosystem and the importance of herring as a forage species for other commercial fish stocks; assess the importance of herring as forage relative to other forage species in the region.

6.2 RESEARCH AND DATA NEEDS

6.2.1 Biological

- Identify known herring spawning areas. Establish critical spawning habitat areas or special management zones to protect spawning aggregations of herring and/or demersal egg masses.
- Investigate bycatch and discards in the directed herring fishery.
- Develop a long-term strategy for assessing individual spawning stocks as a basis for more effective management of any heavily exploited portion(s) of the stock complex. Evaluate the merit of acoustic surveys and other techniques to achieve sub-stock complex monitoring.
- Develop new approaches to estimating recruitment (i.e. juvenile abundance) from fishery-independent data.
- Consider using NEFSC fall survey mean weights at age as the spawning stock mean weight at age in the estimation of biological reference points. Evaluate alternative catch weights at age.
- Investigate alternative methods of estimating mean weight at age used to determine the age composition of U.S. and Canadian landings from the coastal stock complex.
- Conduct a retrospective analysis of herring larval and assessment data to determine the role larval data plays in anticipating stock collapse and as a tuning index in the age-structured assessment.
- Continue resource monitoring activities, especially larval surveys to indicate the relative importance of individual spawning areas and stocks and the degree of spawning stock recovery on Georges Bank and Nantucket Shoals.
- Evaluate the concept of a fixed spawning stock size or spawning target for the herring coastal stock complex. Determine the adequacy of present methods and data to set a target if more appropriate.
- Investigate the effects of averaging maturity rates over blocks of years to help smooth some of the inter-annual variability in the calculation of spawning stock biomass.
- Consider potential discards if fishing mortality increases in the future.
- Investigate the validity extremely high recruitment in recent years.
- Investigate bycatch/discards in the directed herring fishery through both at-sea and portside sampling.
- Develop and test gear modifications to minimize interactions with non-target species in the herring fishery.

6.2.2 Social and Economic

- Develop economic analyses necessary to evaluate the costs and benefits associated with different segments of the industry.
- Develop socio-economic analyses appropriate to the determination of optimum yield.
- Organize annual US-Canada workshops to coordinate stock assessment activities and optimize cooperation in management approaches between the two countries.

7.0 PROTECTED SPECIES

In the fall of 1995, Commission member states, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) began discussing ways to improve implementation and enforcement of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) in state waters. In November 1995, the Commission, through its Interstate Fisheries Management Program (ISFMP) Policy Board, approved an amendment of its ISFMP Charter (section 6(b)(2)) so that protected species and their interactions with ASMFC managed fisheries are addressed in the Commission's fisheries management planning process. Specifically, the Commission's fishery management plans (FMP) will describe impacts of state fisheries on certain marine mammals and endangered species (collectively termed "protected species"), and recommend ways to minimize these impacts. The following section outlines: (1) the federal legislation that guides protection of marine mammals and sea turtles, (2) the protected species with potential fishery interactions; (3) the specific type(s) of fishery interaction; (4) population status of the affected protected species; and (5) potential impacts to Atlantic coastal state and interstate fisheries.

7.1 MARINE MAMMAL PROTECTION ACT (MMPA) REQUIREMENTS

The 1994 amendments to the MMPA established both short- and long-term goals for reducing mortality and serious injury, or bycatch, of marine mammals incidental to commercial fisheries. The amendments also established take reduction plans (TRPs) and stakeholder-based take reduction teams (TRTs) as the mechanisms for achieving these goals. The MMPA requires NMFS to convene TRTs to develop TRPs for each strategic stock that interacts with a Category I or II fishery, fisheries with "frequent" or "occasional" marine mammal bycatch, respectively. (Fisheries that have a remote likelihood of or no known bycatch of marine mammals are classified in Category III.) A strategic stock is defined as a stock: (1) for which the level of direct human-caused mortality exceeds the potential biological removal (PBR)[1] level; (2) which is declining and is likely to be listed under the ESA in the foreseeable future; or (3) which is listed as a threatened or endangered species under the ESA or as a depleted species under the MMPA. In the short-term (within six months of implementation), TRPs must reduce marine mammal bycatch to levels below a marine mammals stock's potential biological removal level. In the long-term (within five years of implementation), TRPs must reduce marine mammal bycatch to

[1] PBR is the number of human-caused deaths per year each stock can withstand and still reach an optimum population level. This is calculated by multiplying "the minimum population estimate" by "½ stock's net productivity rate" by "a recovery factor ranging from 0.1 for endangered species to 1.0 for healthy stocks."

insignificant levels approaching a zero mortality and serious injury rate taking into account the economics of the fishery, the availability of existing technology, and existing state or regional fishery management plans.

The 1994 amendments also required fishermen in Category I and II fisheries to register under the Marine Mammal Authorization Program (MMAP), the purpose of which is to provide an exception for commercial fishermen from the general taking prohibitions of the MMPA; to take on board an observer if requested to do so by the Secretary of Commerce; and to comply with any applicable TRP or emergency regulations. All commercial fishermen, regardless of the category of the fishery in which they participate, must report all marine mammal bycatch.

Section 101(a)(5)(E) of the MMPA requires the authorization of the incidental taking of individuals from marine mammal stocks listed as threatened or endangered under the ESA in the course of commercial fishing operations if it is determined that (1) incidental mortality and serious injury will have a negligible impact on the affected species or stock; (2) a recovery plan has been developed or is being developed for such species or stock under the ESA; and (3) where required under section 118 of the MMPA, a monitoring program has been established, vessels engaged in such fisheries are registered in accordance with section 118 of the MMPA, and a take reduction plan has been developed or is being developed for such species or stock. Permits are not required for Category III fisheries; however, any serious injury or mortality of a marine mammal must be reported.

7.2 ENDANGERED SPECIES ACT REQUIREMENTS

The taking of endangered sea turtles and marine mammals is prohibited under section 9 of the ESA. NMFS may issue section 4(d) protective regulations necessary and advisable to provide for the conservation of threatened species. There are several mechanisms established in the ESA to avoid the takings prohibition in section 9. First, a 4(d) regulation may include less stringent requirements intended to reduce incidental take and thus allow for the exemption from the taking prohibition. Section 10(a)(1)(B) of the ESA authorizes NMFS to permit, under prescribed terms and conditions, any taking otherwise prohibited by section 9 of the ESA, if the taking is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Finally, section 7(a) requires NMFS to consult with each federal agency to ensure that any action that is authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species. Section 7(b) authorizes incidental take of listed species after full consultation and identification of reasonable and prudent alternatives or measure to monitor and minimize such take.

7.3 PROTECTED SPECIES WITH POTENTIAL FISHERY INTERACTIONS

There are numerous species that inhabit the range of the Atlantic herring management unit covered under this FMP that are protected under the MMPA and ESA. Twelve species are classified as endangered or threatened under the ESA, while the remainder are protected by the provisions of the MMPA.

Cetaceans	
Northern right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Blue whale (*Balaenoptera musculus*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Sperm whale (*Physeter macrocephalus*)	Endangered
Minke whale (*Balaenoptera acutorostrata*)	Protected
Harbor porpoise (*Phocoena phocoena*)	Protected
Risso's dolphin (*Grampus griseus*)	Protected
Pilot whale (*Globicephala* spp.)	Protected
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected
Short-beaked common dolphin (*Delphinus delphis*)	Protected
Spotted and striped dolphins (*Stenella* spp.)	Protected
Bottlenose dolphin (*Tursiops truncatus*)	Protected
Pinnipeds	
Harbor seal (*Phoca vitulina*)	Protected
Gray seal (*Halichoerus grypus*)	Protected
Harp seal (*Phoca groenlandica*)	Protected
Hooded seal *(Cystophora cristata)*	Protected
Sea Turtles	
Leatherback turtle (*Dermochelys coriacea*)	Endangered
Kemp's ridley turtle (*Lepidochelys kempii*)	Endangered
Green turtle (*Chelonia mydas*)[2]	Endangered
Hawksbill turtle (*Eretmochelys imbricata*)	Endangered
Loggerhead turtle (*Caretta caretta*), Northwest Atlantic DPS	Threatened
Fish	
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic salmon (*Salmo salar*)[3]	Endangered

NOAA Fisheries has developed a list of species of concern that include: 1) species for which there are concerns regarding danger of extinction or risk of becoming endangered but for which insufficient information is available to indicate a need to list; 2) species for which an ESA biological status review has determined that listing is not warranted but for which significant concerns or uncertainties remain; 3) species that are undergoing formal status reviews. The objectives of the Species of Concern designation are to:

- Identify species potentially at risk;

2 Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters. On March 23, 2015, a proposed rule was issued to remove the current range-wide listing and, in its place, list eight DPSs as threatened and three as endangered (80 FR 15272).

3 The Gulf of Maine distinct population segment (DPS) of Atlantic salmon is endangered, all other Atlantic salmon is considered a species of concern.

- Increase public awareness about those species;
- Identify data deficiencies and uncertainties in species' status and threats;
- Stimulate cooperative research efforts to obtain the information necessary to evaluate species status and threats; and
- Foster voluntary efforts to conserve the species before listing becomes warranted.

Species of concern in New England include:

Dusky shark (*Carcharhinus obscurus)*
Sand tiger shark (*Odontaspis Taurus)*
Barndoor skate *(Raja laevis)*
Thorny skate *(Raja radiata)*
Atlantic sturgeon *(Acipenser oyxrinchus oxyrinchus)*
Atlantic salmon *(Salmo salar)*
Rainbow smelt *(Osmerus mordax)*
Cusk *(Brosme brosme)*
Atlantic wolfish *(Anarhichas lupus)*
Atlantic halibut *(Higgoglossus hippoglossus)*
Atlantic white marlin *(Tetrapturus albidus)*

7.4 PROTECTED SPECIES INTERACTIONS WITH EXISTING FISHERIES

Although all of the protected species listed above may be found in the general geographical area covered by the Herring FMP not all are affected by the fishery. Some species may inhabit areas other than those in which the fishery is prosecuted, prefer a different depth or temperature zone, or may migrate through the area at times when the fishery is not in operation. In addition, certain protected species may not be vulnerable to capture or entanglement with the gear used in the fishery.

Atlantic herring occur in large schools, inhabiting coastal and continental shelf waters from Virginia to Labrador, Canada, and support a commercial fishery. Landings exceeded 150 million pounds throughout the late 1880s and early 1900s, and again in the late 1940s and 1950s. Today, landings are lower, ranging from 80 to 100 million pounds; the majority of which is taken from the Gulf of Maine. Otter trawls, both single and pair, and purse seines are used in the majority of catches in the Atlantic herring fishery.

7.4.1 Marine Mammals

Marine mammal interactions have been recorded in the primary fisheries (utilizing otter trawls and purse seines) that target Atlantic herring, including the Northeast mid-water trawl (including pair trawl) fishery and the Gulf of Maine Atlantic herring purse seine fishery. Marine mammal stocks of greatest concern that interact with this fishery are the western North Atlantic long-finned and short-finned pilot whales, western North Atlantic white-sided dolphin, and Gulf of Maine/Bay of Fundy harbor porpoise. The MMPA 2004 List of Fisheries (LOF) (69 FR 48408) classifies fisheries by the level of serious injury and mortality of marine mammals incidental to

each fishery. The following table indicates the species encountered by the Atlantic herring fisheries.

Fishery Description	Marine Mammal Species Incidentally Killed/Injured
CATEGORY II	
Northeast mid-water trawl (including pair trawl)	Harbor seal, Long-finned pilot whale, Short-finned pilot whale, White-sided dolphin
CATEGORY III	
Gulf of Maine Atlantic herring purse seine	Harbor porpoise, Harbor seal, Gray seal

Subsequent sections discuss documented interactions with the primary species of concern, e.g., pilot whales, white-sided dolphins, and harbor porpoises. These bycatch reports do not represent a complete list, but rather available records. It should be noted that without adequate observer programs for these fisheries; actual numbers of interactions are difficult to obtain. Until very recently, the level of observer coverage has been minimal despite the 1999 re-categorization of the herring mid-water trawl fishery to Category II on the Marine Mammal Protection Act's (MMPA's) List of Fisheries. This change was to have permitted observers to collect data to more accurately document interactions. Category II fisheries have an occasional likelihood of causing incidental mortality and/or serious injury to marine mammals. The recent 2004 ramping up of observer coverage could provide additional information on protected species interactions in herring mid-water gear, whether vessels are engaged in domestic or foreign fishing.

7.4.1.1 Mid-Water Trawl

Pilot Whale

Interactions between both short-finned and long-finned pilot whales and the Northeast mid-water trawl (including pair trawl) fishery have been documented. These two species are difficult to distinguish at sea as separate species and, therefore, abundance estimates, PBR, and bycatch estimates are combined into one listing for pilot whales There were no domestic mid-water trawl trips observed in 1997-1998, 3 trips observed in 1999 (1 single; 2 paired), 13 trips in 2000 (12 single; 1 paired), and no trips in 2001. There were no marine mammal takes observed from the domestic mid-water trawl fishing trips during 1997-2001. A USA joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August - December 2001. A Total Allowable Level of Foreign Fishing (TALFF) was also granted during the same time period. Ten vessels (3 foreign and 7 American), fishing both single and paired mid-water trawls, participated in the 2001 Atlantic herring JV fishery. Two out of the three foreign vessels also participated in the 2001 TALFF and fished with paired mid-water trawls. NMFS maintained 74% observer coverage (243 hauls) of the JV transfers and 100% observer coverage (114 hauls) of the foreign vessels granted a TALFF. Eight pilot whales were incidentally captured in a single mid-water trawl during JV fishing operations. Three pilot whales were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF). The total mortality attributed to the Atlantic herring mid-water trawl fishery in 2001 was 11 animals.

White-sided Dolphin
There were no domestic mid-water trawl trips observed in 1997-1998, 3 trips in 1999 (1 single; 2 paired), 13 trips in 2000 (12 single; 1 paired), and no trips in 2001. There were no marine mammal takes observed from the domestic mid-water trawl fishing trips during the period 1997-2001. A USA joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August -December 2001. A TALFF was also granted during the same time period. Ten vessels (3 foreign and 7 American), fishing both single and paired mid-water trawls, participated in the 2001 Atlantic herring JV fishery. Two out of the three foreign vessels also participated in the 2001 TALFF and fished with paired mid-water trawls. The NMFS maintained 74% observer coverage (243 hauls) on the JV transfers and 100% observer coverage (114 hauls) on the foreign vessels granted a TALFF. No white-sided dolphins were incidentally captured in the mid-water trawl during JV fishing operations. Two white-sided dolphins were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF). The total mortality attributed to the Atlantic herring mid-water trawl fishery in 2001 was 2 animals.

7.4.1.2 Purse Seine

Harbor Porpoise
Harbor porpoises are listed on the MMPA 2004 List of Fisheries (LOF) as interacting with the Gulf of Maine Atlantic herring purse seine fishery. However, no interactions are documented in the most recent stock assessment report for the Gulf of Maine/Bay of Fundy harbor porpoise stock.

7.4.2 Sea Turtles

Interactions with sea turtles may occur when fishing effort overlaps with sea turtle distribution. Interactions could occur in the summer and fall, as turtles can be found in northeastern waters from June to November. Juvenile and immature Kemp's ridleys and loggerheads utilize nearshore and inshore waters north of Cape Hatteras during the warmer months and can be found as far north as the waters in and around Cape Cod Bay. Sea turtles are likely to be present off the Virginia, Maryland and New Jersey coasts by April or May, but do not arrive in great concentrations in New York and northwards until mid-June. Although uncommon north of Cape Hatteras, immature green sea turtles also use northern inshore waters during the summer and may be found as far north as Nantucket Sound. Leatherbacks migrate north in the spring to productive foraging grounds off Nova Scotia. With the decline of water temperatures in late fall, sea turtles migrate south to warmer waters. When water temperatures are greater than approximately 11˚C, sea turtles may be present in some areas where the Atlantic herring fishery occurs.

There are not data available that can be used to estimate the number of threatened or endangered sea turtles that might be taken in herring gear. Nevertheless, based on observed takes from sea sampling data from other fisheries for gear types that may be used in the herring fishery, NMFS believes that it would be reasonable to expect, as a precaution, six loggerhead sea turtles to be taken by the proposed fishery (three of these takes would be lethal) and one green sea turtle, Kemp's ridley sea turtle and leatherback sea turtle to be taken by the proposed fishery. Based on

the information available on the distribution and abundance of these sea turtle species in the actions area, NMFS does not believe the death, capture or injury of these small numbers of sea turtles would appreciably diminish the viability of sea turtle populations in the action area. Further, NMFS does not believe it would be reasonable to expect that the death, capture, harm or harassment of these numbers of sea turtles would appreciably reduce the likelihood of survival and recovery of these species in the wild (excerpted from NMFS, 1999).

Based on information collected in similar fisheries, the major gear types used in the herring fishery appear to have little or no interactions with sea turtles, although it must be acknowledged there has been an extremely low level of observer coverage in this fishery to date. In addition, there appears to be little spatial/temporal overlap in the distribution of Atlantic herring and sea turtles.

7.4.3 Seabirds

Like marine mammals and sea turtles, seabirds are vulnerable to entanglement in commercial fishing gear. Along with commercial fishing, human activities such as coastal development, habitat degradation and destruction, and the presence of organochlorine contaminants are considered to be major threats to some seabird populations.

The otter trawl and the purse seine are the primary commercial gears used in the Atlantic herring fishery, accounting for the vast majority of the landings. These gears do not appear to be a significant source of incidental seabird takes.

7.5 HERRING AS A FORAGE SPECIES

Atlantic herring is one of many important forage species in the Northeast Atlantic Ocean ecosystem. While available information to quantify the importance of herring as a forage species is not available at this time, there is a substantial amount of literature that describes the role that herring plays in the ecosystem and estimates the amount of herring consumed by various fish, marine mammal, and seabird species.

Observational and empirical evidence suggests that there are four major groups of predators (marine mammals, large pelagic fishes, seabirds, and medium demersal) that feed on Atlantic herring in the Gulf of Maine-Georges Bank region. Many marine mammal populations in the region have increased dramatically in the last 20 years (NMFS 2002). Observations on the larger marine mammals such as humpback and fin whales suggest that these large predators have changed their diets to incorporate a larger proportion of herring during the 1990s and 2000s, instead of a diet that was dominated by sand lance in the 1980s (Read and Brownstein 2003). Smaller marine mammals such as harbor porpoise and harbor seals are also relying on Atlantic herring, based on diet studies from captured or stranded animals (Gannon et al. 1998; Williams 1999). Seabirds such as Northern gannets, shearwaters, and herring gulls are also likely preying routinely on herring (Powers and Backus 1987).

Read and Brownstein (2003) used survey-based estimates of abundance for eight species of marine mammals between 1991 and 1997 to estimate the total annual consumption of Atlantic

herring by these species (Table 9). Their estimates of marine mammal consumption ranged from about 94,000 to 190,000 mt of herring per year. Their results show that minke whales, harbor porpoises, and white-sided dolphins are major predators on Atlantic herring because of high proportions of herring (34-51%) in their diets, whereas fin and humpback whales consume large quantities of herring to sustain their large body mass. Despite a three-fold increase in the harbor seal population in the Gulf of Maine between 1981 and 1997, herring only make up 13% of their diet. Consequently, the mean consumption estimate for harbor seals is below 5,000 mt a year.

Read and Brownstein's (2003) mean (or "best") estimate of Atlantic herring consumed annually by marine mammals during 1991-1997 was about 140,000 mt, with a range of 93,000-200,000 mt. Adding these estimates to the most current (1997) estimate of 100,000 mt of Atlantic herring consumed by fish and elasmobranch predators reported by Overholtz et al. (2000) produces a total mean estimate of 240,000 mt, with a range of 193,000-300,000 mt. During the 1990s, the total amount of herring consumed by all predators could have been as high as 400-450,000 mt.

Table 9. Marine Mammal Predators and Annual Consumption Rates (Read and Brownstein, 2003)

Marine Mammal Predators	
Species	**Estimated Annual Consumption (mt), 1991-1997**
Fin Whale	16,081-62,362
Minke Whale	11,648-22,108
Humpback Whale	31,046-35,507
Pilot Whale	149-512
Harbor Porpoise	20,863-27,655
White-sided Dolphin	7,852-35,591
Harbor Seal	4,853
Gray Seal	1,310

7.6 POPULATION STATUS REVIEW OF RELEVANT PROTECTED SPECIES

7.6.1 Marine Mammals

Five marine mammal species are known to become entangled in gear used by the Atlantic herring fishery, namely, harbor porpoise, pilot whale, white-sided dolphin, harbor seal and gray seal. Both short and long-finned pilot whales are classified as strategic stocks under the MMPA. The status of these and other marine mammal populations inhabiting the northwest Atlantic Ocean has been discussed in great detail in the annual U.S. Atlantic Marine Mammal Stock Assessment Report. The reports present information on stock definition, geographic range, population size, productivity rates, potential biological removal levels (PBR – the number of human-caused deaths the stock can withstand annually and still reach and maintain an optimum population level), and fishery-specific mortality estimates and also compares the PBR to estimated human-caused mortality for each stock. To access the stock assessment report, see the

NMFS website at
http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/sars.html.

7.6.1.1 Harbor Porpoise

The Gulf of Maine harbor porpoise was proposed to be listed as threatened under the ESA on January 7, 1993 (NMFS, 1993), but NMFS determined this listing was not warranted (NMFS, 1999). NMFS removed this stock from the ESA candidate species list in 2001. The PBR for the harbor porpoise is 747 animals (NMFS, 2002). The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR level, which means the human-induced mortality is not approaching a zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury has not exceeded the PBR level in recent years.

Harbor porpoises range from Labrador to North Carolina. The southern-most stock of harbor porpoise is referred to as the Gulf of Maine/Bay of Fundy stock and generally spends its winters in the Mid-Atlantic region. Harbor porpoises are generally found in coastal and inshore waters, but will also travel to deeper, offshore waters. The status of the harbor porpoise stock in U.S. waters relative to the optimum sustainable population is unknown. There are insufficient data to determine population trends for this species because harbor porpoises are widely dispersed in small groups, spend little time at the surface, and distribution varies unpredictably from year to year depending on environmental conditions (NMFS, 2002).

Shipboard line transect sighting surveys have been conducted to estimate population size of the harbor porpoise stock. The best estimate of abundance for the Gulf of Maine/Bay of Fundy harbor porpoise stock is 89,700. The minimum population estimate is 74,695 individuals (NMFS, 2002).

7.6.1.2 Pilot Whale

The two species of pilot whales in the Atlantic, long-finned and short-finned pilot whales, are difficult to distinguish to the species level at sea. The species tend to overlap from New Jersey to Cape Hatteras, North Carolina. Sightings north of this overlapping area are likely long-finned pilot whales, while sightings south of this area are more likely short-finned pilot whales.

Both long-finned and short-finned pilot whale abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel, and squid stocks. The total number of long-finned and short-finned pilot whales off the eastern U.S. is unknown. Because long-finned and short-finned pilot whales are difficult to identify at sea, seasonal abundance estimates were reported for *Globicephala* species as a whole. The best abundance estimate for pilot whales (*Globicephala sp.*) is 14,524 and the minimum population estimate is 11,343 individuals.

Long-finned pilot whale
The status of long-finned pilot whales, *Globicephala melas*, relative to their optimum sustainable population is unknown, and there are insufficient data to determine a population trend for this

species. Long-finned pilot whales are not listed under the ESA, but are considered a strategic stock because the 1996-2000 estimated average annual fishery-related mortality exceeds the PBR level (108) for this species.

Long-finned pilot whales range from North Carolina north to Iceland and Greenland and east to North Africa. Off the northeast U.S. coast, pilot whales are distributed principally along the continental shelf edge in the winter and early spring. In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters until late autumn. Pilot whales generally prefer areas of high relief or submerged banks, and also areas associated with the Gulf Stream north wall and thermal fronts along the continental shelf edge. Stock structure of the long-finned pilot whale is uncertain, although it has been proposed that two populations exist (a warm-water population and a cold-water population) related to sea surface temperature (Fullard et al., 2000).

Short-finned pilot whale

The status of short-finned pilot whales, *Globicephala macrorynchus*, relative to their optimum sustainable population, is unknown, and there are insufficient data to determine a population trend for this species. Short-finned pilot whales are not listed under the ESA, but are considered a strategic stock because the 1996-2000 estimated average annual fishery-related mortality exceeds the PBR level (108) for this species.

Short-finned pilot whales range worldwide in tropical to warm temperate waters with North Carolina considered the northern extent of their range in U.S. waters. Sightings within U.S. waters are primarily within the Gulf Stream and along the continental shelf and continental slope in the northern Gulf of Mexico. No information is available on stock structure for this species.

7.6.2 Sea Turtles

All sea turtles that occur in U.S. waters are listed as either endangered or threatened under the ESA. The Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) are listed as endangered. The loggerhead (*Caretta caretta*) and green turtle (*Chelonia mydas*) are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific coast of Mexico, which are listed as endangered. All five of these species inhabit the waters of the U.S. Atlantic and Gulf of Mexico.

NOAA Fisheries recognizes five loggerhead subgroups within the western Atlantic including two primary subpopulations: 1) a northern nesting subpopulation that occurs from North Carolina to northeast Florida, about 29ºN (approximately 7,500 nests in 1998); 2) a south Florida nesting subpopulation, occurring from 29ºN on the east coast to Sarasota, Florida on the west coast (mean of 73,751 nests each year). The status of the northern population based on the number of loggerhead nests has been classified as stable or declining (TEWG, 2000). Data from all beaches within the south Florida subpopulation where nesting activity has been recorded indicate substantial increases when data are compared over the last 25 years. However, an analysis limited to nesting data from the statewide sea turtle Index Nesting Beach Survey program from 1989 to 2002, a period encompassing index surveys that are more consistent and

more accurate than surveys in previous years, has shown no detectable trend (Blair Witherington, Florida Fish and Wildlife Conservation Commission (FFWCC, pers. comm., 2002).

The Kemp's ridley is one of the most endangered of the world's sea turtle species. The only major nesting site for Ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico. Estimates of the adult female nesting population reached a low of 300 in 1985. Conservation efforts by Mexican and U.S. agencies have aided this species by eliminating egg harvest, protecting eggs and hatchlings, and reducing at-sea mortality through fishing regulations. From 1985 to 1999, the number of nests observed at Rancho Nuevo, and nearby beaches increased at a mean rate of 11.3% per year (TEWG, 1998). Current totals exceed 8,000 nests per year, allowing cautious optimism that the population is on its way to recovery.

Recent population estimates for green sea turtle in the western Atlantic area are not available. However, the pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in 1989.

Leatherback populations in the eastern Atlantic (*i.e.*, off Africa) and Caribbean appear to be stable, but there is conflicting information for some sites (Spotila, pers. comm.) and it is certain that some nesting populations (*e.g.*, St. John and St. Thomas, U.S. Virgin Islands) have been extirpated (NMFS and USFWS, 1995). Data collected in southeast Florida clearly indicate increasing numbers of nests for the past twenty years (9.1-11.5% increase), although it is critical to note that there was also an increase in the survey area in Florida over time (NOAA Fisheries SEFSC, 2001).

7.7 EXISTING AND PROPOSED FEDERAL REGULATIONS/ACTIONS PERTAINING TO RELEVANT PROTECTED SPECIES

7.7.1 Marine Mammals

7.7.1.1 Harbor Porpoise

On December 1, 1998, NMFS published a final rule to implement the Harbor Porpoise Take Reduction Plan for the Gulf of Maine and the Mid-Atlantic coastal waters. The Northeast sink gillnet and Mid-Atlantic coastal gillnet fisheries are the two fisheries regulated by the HPTRP (63 FR 66464, December 2, 1998; also defines fishery boundaries). Among other measures, the HPTRP uses time/area closures in combination with acoustical devices (e.g., pingers) in Northeast waters, and time/area closures along with gear modifications for both small mesh (greater than 5 inches (12.7 cm) to less than 7 inches (17.78 cm)) and large mesh (greater than or equal to 7 inches (17.78 cm) to 18 inches (45.72 cm)) gillnets in Mid-Atlantic waters. Although the HPTRP predominately impacts spiny dogfish and monkfish fisheries due to high rates of porpoise bycatch, other gillnet fisheries are also managed under the HPTRP.

Copies of the final rule are available from the Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910-3226. Additional

information regarding the rule and its changes can also be accessed via the Internet at http://www.nero.nmfs.gov/porptrp/.

7.7.1.2 Pilot Whale

There are no take reduction measures currently in place for pilot whales in the Atlantic Ocean. However, NMFS plans to convene two new take reduction teams in 2005 and 2006 to address incidental takes of pilot whales in Atlantic pelagic longline and trawl fisheries. The Pelagic Longline TRT will convene in June of 2005 and the Trawl TRT will follow in 2006.

7.7.2 Sea Turtles

Under the ESA, and its implementing regulations, taking sea turtles – even incidentally – is prohibited, with exceptions identified in 50 CFR 223.206. The incidental take of endangered species may only legally be authorized by an incidental take statement or an incidental take permit issued pursuant to section 7 or 10 of the ESA.

Existing NMFS regulations specify procedures that NMFS may use to determine that unauthorized takings of sea turtles are occurring during fishing activities, and to impose additional restrictions to conserve sea turtles and to prevent unauthorized takings (50 CFR 223.206(d)(4)). Restrictions may be effective for a period of up to 30 days and may be renewed for additional periods of up to 30 days each.

7.7.3 Seabirds

Under the Migratory Bird Treaty Act it is unlawful "by any means or in any manner, to pursue, hunt, take, capture, [or] kill" any migratory birds except as permitted by regulation (16 U.S.C. 703). The regulations at 50 CFR 21.11 prohibit the take of migratory birds except under a valid permit or as permitted in the implementing regulations. The US Fish and Wildlife Service's Policy on Waterbird Bycatch states:

> *"It is the policy of the U.S. Fish and Wildlife Service that the Migratory Bird Treaty Act of 1918, as amended, legally mandates the protection and conservation of migratory birds. Avian conservation is of significant concern to many in the United States. Substantial numbers of waterbirds (especially seabirds, but also waterfowl, shorebirds, and other related wading species) are killed annually in fisheries, making waterbird bycatch a serious conservation issue and a violation of the underlying tenets of the MBTA. The goal of the U.S. Fish and Wildlife Service is the elimination of waterbird bycatch in fisheries. The Service will actively expand partnerships with regional, national, and international organizations, States, tribes, industry, and environmental groups to meet this goal. The Service, in cooperation with interested parties, will aggressively promote public awareness of waterbird bycatch issues, and gather the scientific information to develop and provide guidelines for management, regulation, and compliance."*

7.8 POTENTIAL IMPACTS TO ATLANTIC COASTAL STATE AND INTERSTATE FISHERIES

Regulations developed under the future trawl take reduction plan for pilot whales have the potential to impact trawl fisheries that target Atlantic herring.

7.9 IDENTIFICATION OF CURRENT DATA GAPS AND RESEARCH NEEDS

7.9.1 Marine Mammal Research Needs

- Abundance estimates capable of distinguishing short-finned from long-finned pilot whales are needed to achieve more accurate status assessments for this species and to improve the ability to monitor them.

7.9.2 Sea Turtle Research Needs

- In order to better understand sea turtle populations and the impacts of incidental take in Atlantic herring fisheries, in-water abundance estimates of sea turtles are needed to achieve more accurate status assessments for these species and improve our ability to monitor them.

7.9.3 Sea Bird Research Needs

- An analysis of existing bird bycatch data for this fishery should be conducted and summarized for the plan.

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9.0 APPENDICES

Appendix 1: Technical Report on Gonadal-Somatic Index-Based Monitoring System for Atlantic Herring Spawning Closures in US Waters
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Introduction
While Atlantic herring reproduce in the same general season each year, the onset, peak and duration of spawning may vary by several weeks annually (Winters and Wheeler, 1996). It is believed that this behavioral plasticity is an evolutionary adaptation that takes advantage of optimal oceanographic conditions (e.g, temperature, plankton availability, etc.) to maximize offspring survival (Sinclair and Tremblay, 1984; Winters and Wheeler, 1996). In an effort to protect the integrity of the spawning stock and allow for increased recruitment, the ASMFC developed a system of seasonal spawning closures in the early 1990s that accounted for this interannual variability in spawning time. Historically, managers have focused on protecting the bulk of spawning during the fall season (August through October), but Atlantic herring are also known to spawn from late July through December. Acknowledging that macroscopic identification of the maturity stage of individual fish is a somewhat subjective process, the closure rule was based on a female gonadal somatic index (GSI), which is assumed to increase linearly as herring approach full maturity (Figures 1 and 2; Equation 1).

1) $GSI = 100 \times [W_{gonad}]/[W_{gonad}-W_{total}]$

At the time of the rule's creation, it was recognized that smaller herring generally have lower GSI values than larger herring (Figure 3). Consequently, separate triggers were established for two size classes: GSI = 15 for 23-27 cm; and GSI = 20 for 28+ cm. According to the closure rule, once two consecutive samples of herring achieve an average female GSI in excess of either trigger, the fishery closes for four weeks. Because all GSI samples are obtained directly from the commercial herring fishery, it is not always possible to collect sufficient data to inform the start of the spawning closure. As such, default closure dates were established for each of three areas that presumed a general north-south progression of spawning (Table 1). Despite the design of the closure system, it is fairly common to find spawning herring in fishery samples after the closure. To counteract this, a closure extension rule was established that mandated a two-week additional closure if fishery-dependent sampling revealed that greater than 25% of a post-closure sample contained fish in spawning condition (Stage V or VI).

When the rules were first established in the early 1990s, limited data were available to derive the critical parameters of the GSI-based spawning closure system (i.e., size categories; GSI triggers; default dates; closure duration). Given recent concerns over the adequacy of the system, which initiated the development of Draft Amendment 3 to the Interstate Atlantic Herring Fishery Management Plan (FMP), the Herring Plan Development Team felt that a re-examination of these parameters was warranted in light of an additional two decades worth of GSI sampling data.

Factors Affecting GSI

There is substantial variability in average GSI from one sample to the next, and it is often unclear whether this change is tracking the expected progression of gonad development of the population or is simply a function of the fish size, sample location, gear type, or year. The combined MADMF/MEDMR dataset of fishery-dependent samples includes 8,474 GSI observations (5,435 maturity observations) from 385 samples and covers three inshore spawning areas (Eastern Maine, Western Maine, Massachusetts-New Hampshire); three gear types (purse seine, midwater trawl, and bottom trawl); 15 years (1998-2013); three months (Aug-Oct); and 13 length bins (from 22 to 34 cm). Unfortunately, data are lacking for many factor level combinations (e.g., MWT samples are generally unavailable at the same time/area as other gear types), thereby preventing an analysis of the simultaneous influence of each factor on GSI/maturity using the full dataset. Nonetheless, we can evaluate the influence of several factors by examining a subset of the data. To this end, a generalized linear model (GLM) relating the GSI of female herring to a suite of factors (GSI ~ DAY + YEAR + LENGTH + AREA) was constructed using data from non-midwater trawl trips from the years 2004-2013.

Size

The current size-based closure system assumes that smaller herring achieve full maturity at a lower GSI than larger herring. While this has been demonstrated for the closely related Pacific herring (Ware and Tasanichuk, 1989), there is little evidence for such a relationship in our sample data (Figure 4). An alternative explanation for the observed size-GSI relationship (Figure 3) is a size-dependent arrival on the spawning ground (i.e., larger herring spawn earlier). This phenomenon had been documented in several other herring populations (Boyar 1968; Ware and Tanasichuk, 1989; Oskarsson et al., 2002; Slotte et al., 2000), and is believed to be related to a size-dependent maturation process (Ware and Tanasichuck, 1989), or swimming speed (i.e. larger herring arrive earlier to spawning grounds) (Slotte et al, 2000). Regardless, there is clear evidence of a decreasing average fish size as the spawning season progresses (Figure 5). While it is true that smaller GOM herring generally have lower GSI than larger fish (at a given point in time), it is likely that all sizes achieve a similar maximum GSI, just at different times. As expected, the GLM estimated a strong positive relationship between length and GSI (Table 2 - for every 1 cm increase in length, there is a corresponding increase in GSI of 1.84 points). This slope for the LENGTH parameter can be used to standardize GSI observations to a common herring size, thereby removing the influence of length from GSI sample data.

Year

The strongly significant year effect indicates that the GSI for a given length/date may shift by six (6) or more points from year to year (Table 3). This suggests that the onset of spawning can vary by five or more weeks, underscoring the need for a GSI-based monitoring system instead of fixed closure dates. Several other studies corroborate this level of interannual variability in spawning time (Boyar 1968; Grimm 1983; Stevenson 1989; Winters and Wheeler 1996).

Day

The slope of the DAY parameter (0.19) in the GLM model represents the rate at which GSI increases per day, after controlling for the effects of other factors. Theoretically, this rate could be used to forecast the date when GSI (after adjusting for LENGTH) exceeds a trigger value from a single sample of fish. However, there is likely some interannual variability in this rate,

and it would be more prudent to use samples from within a season to estimate the slope of the DAY parameter to forecast a closure date.

Area

The Eastern Maine (EM) spawning area was identified as having a significantly higher GSI than the other two areas, meaning that spawning occurs earlier in EM than elsewhere. Interestingly, the Western Maine (WM) and Massachusetts-New Hampshire (MA-NH) spawning areas do not appear to have significantly different spawning times. This suggests that these two areas should have a similar default date, or could even be combined to increase the number of samples available for informing spawning closures. Several earlier studies describe the timing of herring spawning in the GOM through the use of fishery-dependent maturity data and direct observation of demersal egg beds (Table 3 - Boyar et al., 1973; Cooper et al., 1975; McCarthy et al., 1979; Stevenson 1989). While these investigations confirm an earlier spawning time in EM than in MA-NH, there is no historical evidence to inform the timing of spawning in the WM area.

Fishing Gear

An alternative GLM was attempted that included gear type (bottom trawl vs purse seine) as an additional predictor variable (GSI ~ DAY + YEAR + LENGTH + AREA + GEAR); While GEAR was a marginally significant predictor of GSI, this more saturated model did not improve fit to the data, as measured by the Bayesian Information Criterion (BIC). This suggests that it is appropriate to combine samples obtained from these gear types. It should be noted that mid-water trawl samples were excluded from this analysis, as this gear rarely operates at the same time/location as the other gears, preventing an objective determination of whether this gear type influences the GSI of a sample.

Proposed Changes to the Closure System

Given that larger herring spawn earlier, it makes sense to standardize GSI observations to a large size class (e.g., 30 cm – 95th percentile of observed lengths), so that the closure period is inclusive of most spawners. Therefore, the observed GSI of each individual fish should be adjusted using the formula (Formula 2), where *a* is the slope of the length parameter from the GLM (*a*=1.84) and *b* is the reference length class (*b*=30 cm):

2) $GSI_{30} = GSI_{obs} + a * (b - TL_{cm})$

Herring are determinate spawners, releasing all of their eggs in a single batch (Kurita and Kjesbu, 2008). Therefore, spawning can be considered imminent at the end of Stage V (i.e., full maturity). However, a range of GSI values has been observed within Stage V that likely represents the final progression of the maturity cycle (Figure 6). Therefore, a point near the high end of the distribution of Stage V GSI values could be considered a reasonable measure of the onset of spawning. Managers could select different points from this distribution as a trigger value, depending on their objectives or risk tolerance. A higher value would shift the fishery closure nearer to the expect onset of spawning, whereas a lower value would shift the closure earlier to provide more protection to pre-spawning fish.

Once the fishery-dependent sampling program has a sufficient number of samples (e.g., a minimum of three) with a significant positive slope to the GSI_{30}~DAY relationship (α= 0.05), a fishery closure date could be forecasted (i.e., the date when GSI_{30} exceeds $GSI_{trigger}$). This forecast could be updated as additional samples are acquired and an official closure date selected

when the forecast is within a certain number of days (e.g., 5 days). If insufficient samples are available to predict the $GSI_{trigger}$ date prior to the default closure date, the default date would apply.

Using GSI sample data from previous seasons, we can estimate the date at which a $GSI_{trigger}$ would have been reached in each year (Figure 7). The average trigger date provides some representation of what an appropriate default closure date might be (Figure 8). Depending on the trigger value used, the average date for the MA-NH area is 4-24 days later than the most robust literature account for this area, which observed the arrival of herring egg beds on Jeffreys ledge between 1972 and 1978 (Table 3 – McCarthy et al., 1979). Most of the contemporary GSI sampling effort has been focused inshore of Jeffreys Ledge, suggesting spatial and/or interannual variation of spawning time within this area. Unfortunately, there are no literature sources available to inform the default date for Western Maine. The GLM model found no significant difference between the two areas; therefore, it appears reasonable to combine the two areas, increasing the number of samples available to inform a larger Tri-State (WM-MA-NH) spawning area (Table 2). With such few GSI samples available to describe the EM area, the historical information of when herring eggs have been observed on lobster traps is likely more applicable for this area (Table 3 – Stevenson 1989).

Contemporary GSI observations are not particularly useful for describing the duration of the spawning period, because fishery-dependent samples are not available once the closure commences. However, several earlier studies in the GOM concur that the typical duration of herring spawning within a particular area is approximately 40 days (Table 3). Therefore, it appears the current 4-week closure period is inadequate and increasing to a 6-week closure (42 days) would provide a better match for the available information on the duration of GOM herring spawning.

By using the sequence of individual samples obtained in previous years, we can apply the proposed closure rules to simulate the performance of the forecasting algorithm. For example, in 2011 a September 11 closure would have been announced on September 6, assuming a choice was made to select a closure date at five days prior (Figure 9).
There are several benefits to the GSI-based closure system as outlined in this paper:

1) By providing a forecasted closure date once an increase in GSI_{30} is detected, all interested parties (samplers, managers, industry) will have advance notice as to when the spawning closure is likely to occur, allowing them to plan their activities accordingly.
2) Because the forecasting model uses the GSI information from all samples to project a closure date, there isn't pressure to obtain two consecutive samples just prior to spawning, a task that has proven difficult in many years. For this reason, default closure dates due to insufficient samples would occur less often.
3) Aligning the assumptions of the closure system with the current understanding of the reproductive ecology of herring will improve the accuracy of and maximize the effectiveness of spawning closures.
4) By directly taking into account the effect of length on GSI, perceived discrepancies between sampling programs (MADMF, MEDMR) can be reconciled.

Ideally, we would have GSI and maturity samples from before, during, and after the spawning season. This would provide a better idea of maximum GSI (i.e. appropriate trigger value), and how that coincides with the presence of Stage V (full maturity) and Stage VI (spawning) fish. Unfortunately, because the GSI-monitoring program is entirely fishery-dependent, there are essentially no samples available once the spawning closure begins. A directed fishery-independent effort to obtain herring samples during and after the closure could provide this information and be used to further refine the parameters of the closure system in the future.

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Table 1. Current default dates for herring spawning closures in the GOM

Spawning Closure Area	Default Closure Date
Eastern Maine (EM)	August 15th
Western Maine (WM)	September 1st
Massachusetts/New Hampshire (MA-NH)	September 21st

Table 2. Output from GLM (GSI ~ DAY + YEAR + LENGTH + AREA).

ANOVA Table:

	Df	Deviance	Resid. Df	Resid. Dev	F	Pr(>F)
NULL			4052	131631		
J	1	18802	4051	112829	1032.017	< 2.2e-16 ***
as.factor(YEAR)	9	4554	4042	108275	27.773	< 2.2e-16 ***
LENGTH	1	32700	4041	75575	1794.853	< 2.2e-16 ***
AREA	2	1990	4039	73585	54.627	< 2.2e-16 ***

Coefficients:

	Estimate	Std. Error
(Intercept)	-83.585212	1.949353
J	0.190262	0.005731
as.factor(YEAR)2005	1.514119	0.595370
as.factor(YEAR)2006	2.999203	0.673709
as.factor(YEAR)2007	1.297457	0.551941
as.factor(YEAR)2008	1.573861	0.630355
as.factor(YEAR)2009	1.881865	0.572551
as.factor(YEAR)2010	0.889922	0.591108
as.factor(YEAR)2011	6.144499	0.572099
as.factor(YEAR)2012	5.147404	0.576039
as.factor(YEAR)2013	5.373736	0.572403
LENGTH	1.838863	0.042996
AREAMA-NH	-2.504169	0.325561
AREAWME	-2.775418	0.265547

Table 3. Literature accounts of the timing and duration of herring spawning in the GOM.

Study	Years	Method	Area	Average First Spawning	Average Last Spawning	Average Season Length (days)
Boyar et al., 1973	1972	Maturity	MA-NH	Sep 10	Oct 20	40
Cooper et al., 1975	1974	Eggs (scuba)	MA-NH	Sep 29	Oct 25	26
McCarthy et al., 1979	1972-1978	Eggs (scuba, sub, grab)	MA-NH	Sep 20	Oct 30	40
Stevenson 1989	1983-1988	Eggs (lobster traps)	EM	Aug 28	Sep 20	40

Figure 1. Observed GSI of female herring by ICNAF maturity stage from 2013 fishery dependent samples from the MA-NH spawning area.

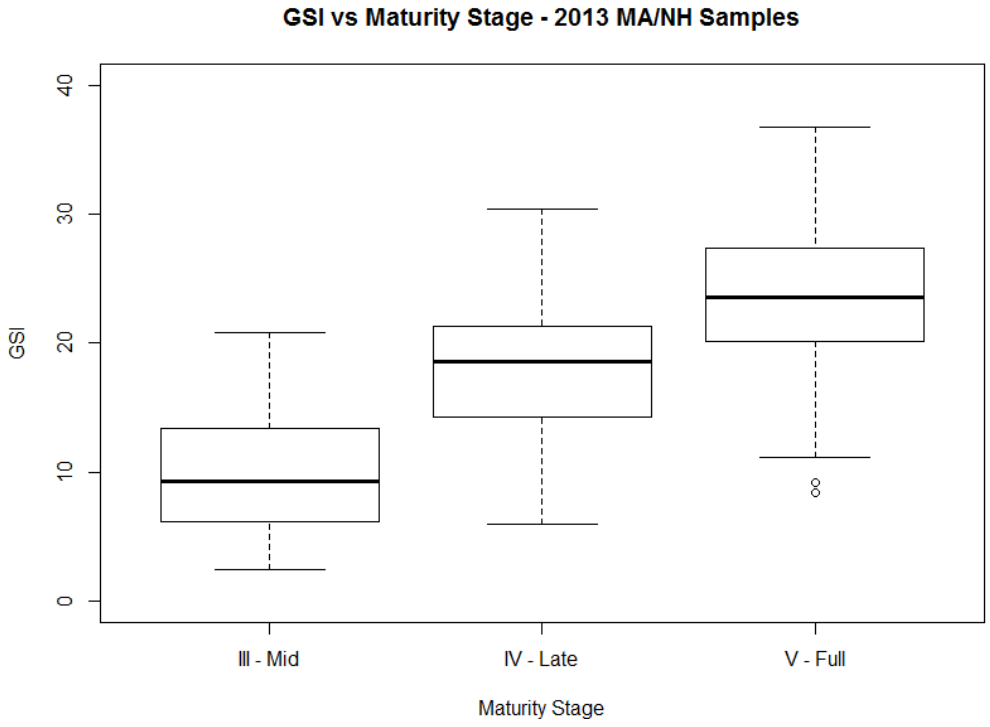


Figure 2. Female GSI by date from 2013 MA-NH samples. The red line indicates a significant positive linear relationship between GSI and sample date.

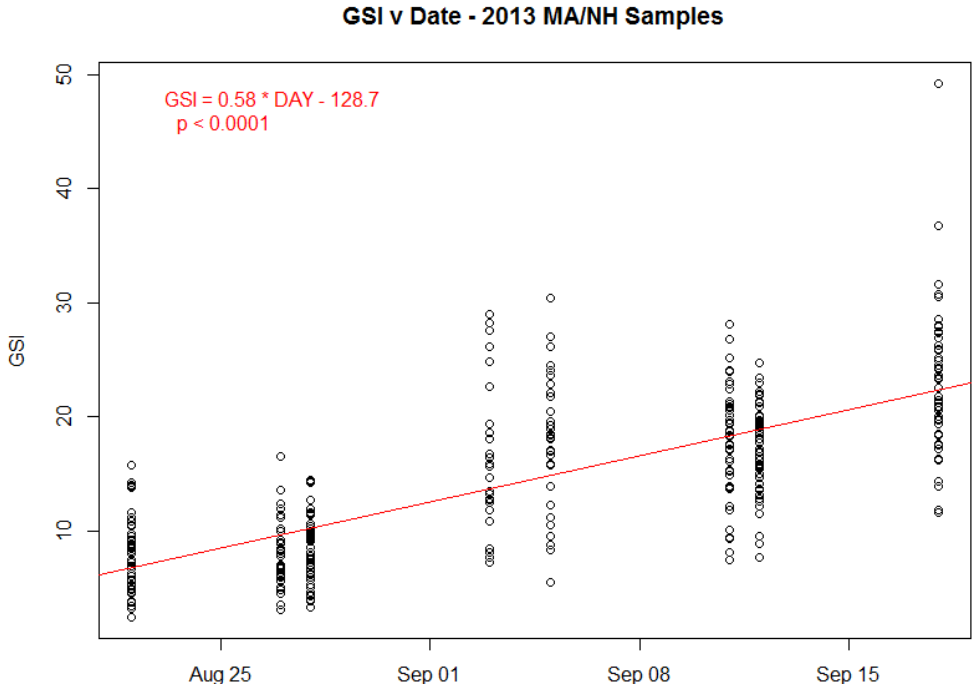


Figure 3. Boxplots of GSI by length bin from all sample data (based on total length).

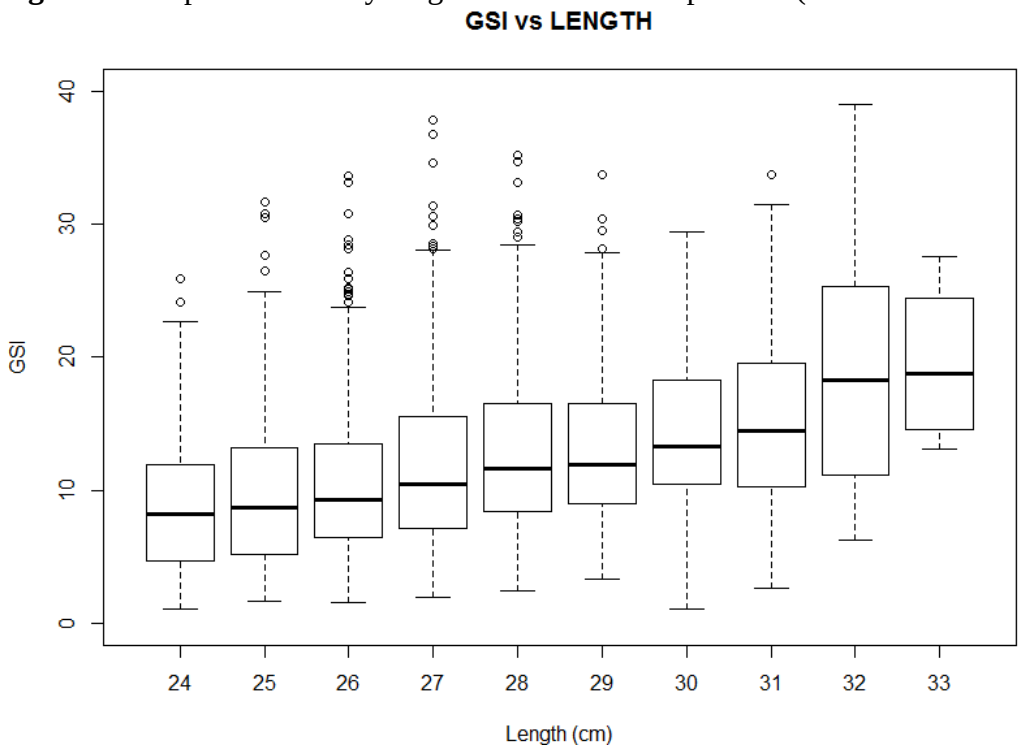


Figure 4. Boxplots of GSI at Stage V (full maturity) by length bin. The current size-based GSI triggers are shown in red (GSI = 15 for 24-27 cm; GSI = 20 for 28+ cm).

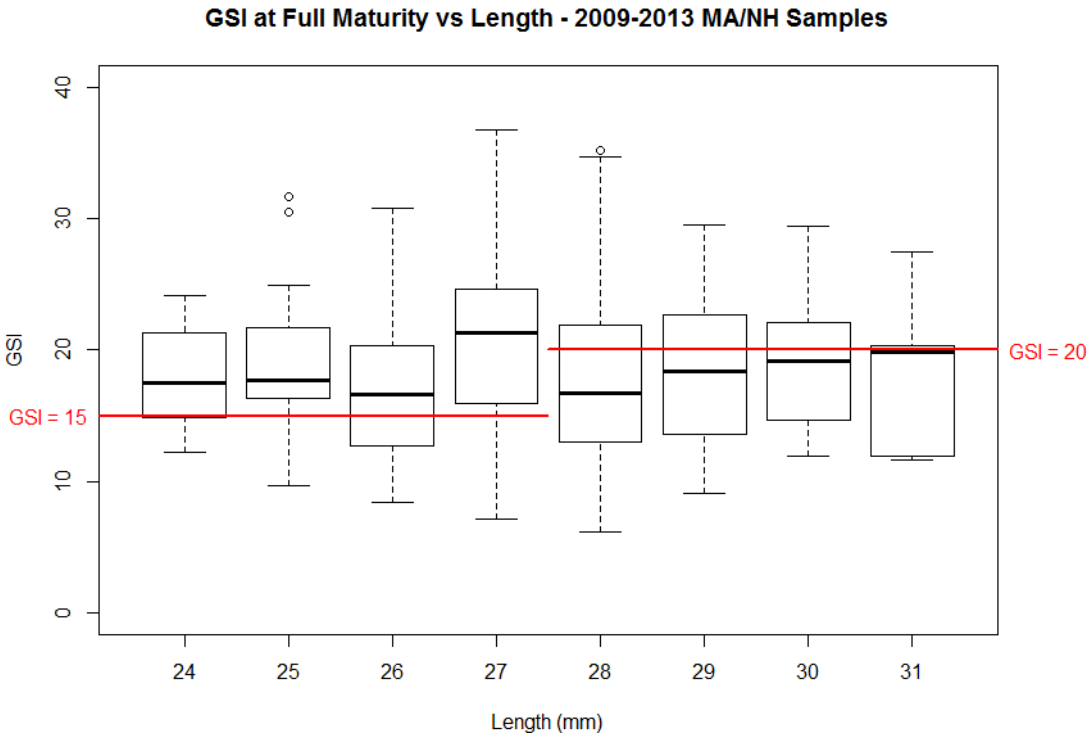


Figure 5. Observed fish length from MEDMR sampling of the MA-NH fishery in 2010. Note the significant decrease in observed fish length over the course of the season.

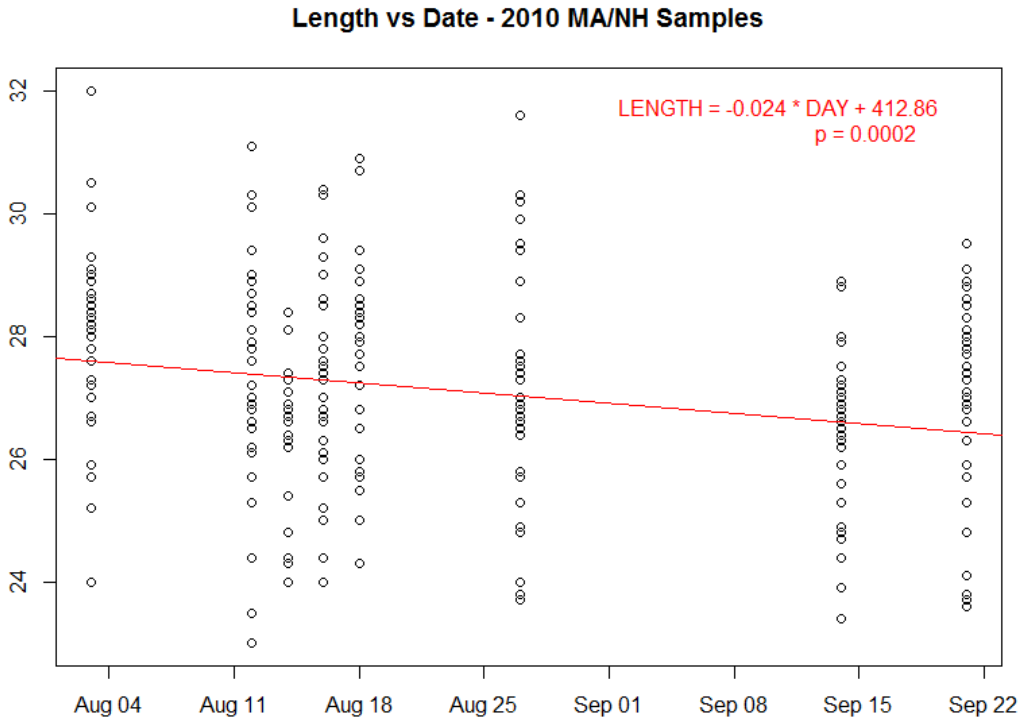


Figure 6. Distribution of GSI values for herring classified as Stage V (full maturity). The GSI value at a series of quantiles are shown in red.

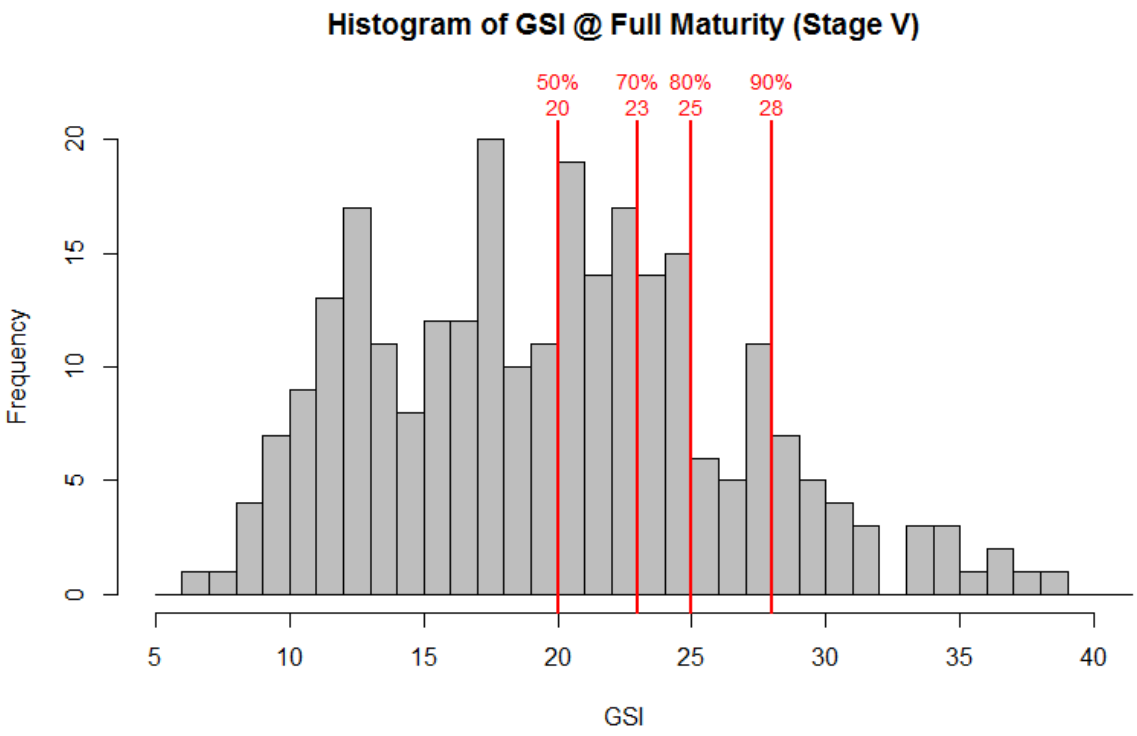

Histogram of GSI @ Full Maturity (Stage V)
50%
20
70%
23
80%
25
90%
28
Frequency
0
5
10
15
20
5
10
15
20
25
30
35
40
GSI

Figure 7. Forecasted dates when GSI_{30} exceeded a range of $GSI_{trigger}$ values for sample data from the Western Maine (WM) and Massachusetts-New Hampshire (MA-NH) spawning areas combined. A diagonal line represents a significant linear relationship between GSI_{30} and sample date. Gray points with error bars represent the mean GSI_{30} per sample +/- 2 standard errors.

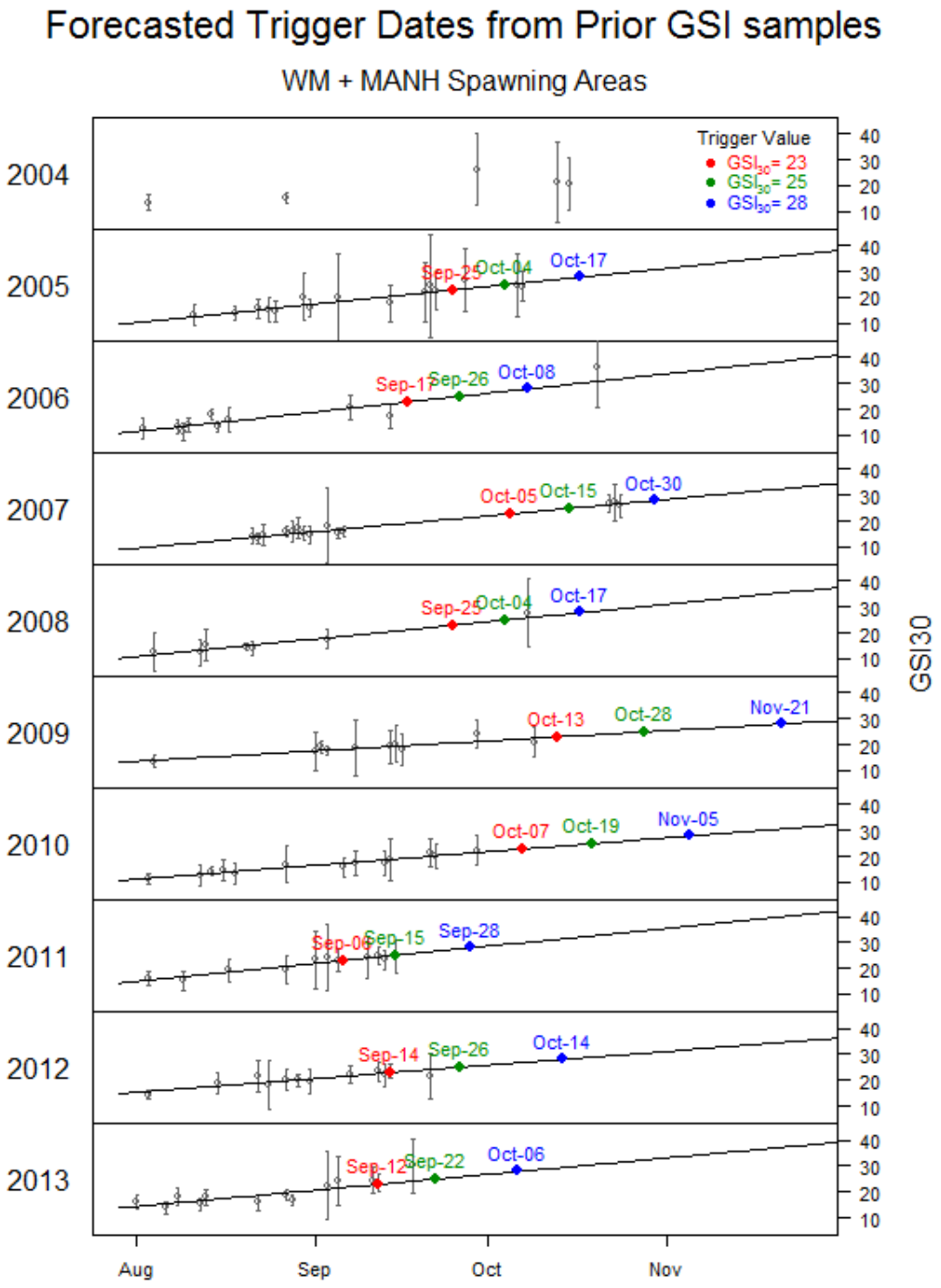


Figure 8. Boxplots of forecasted trigger dates for the WM and MA-NH spawning area combined (same data from Figure 7). The median date for each trigger value is labeled and could be used to set a default closure date for when sufficient samples are unavailable to forecast a trigger date.

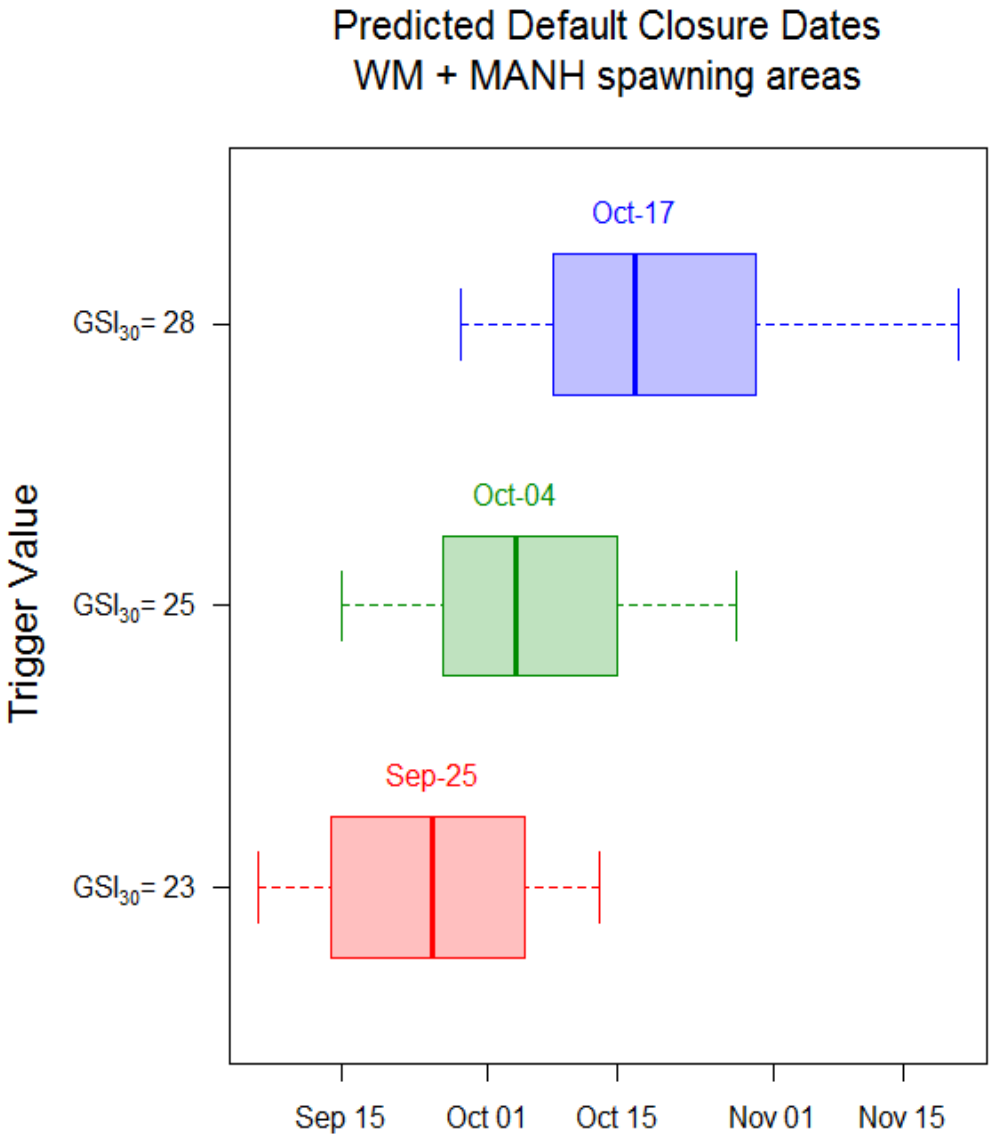
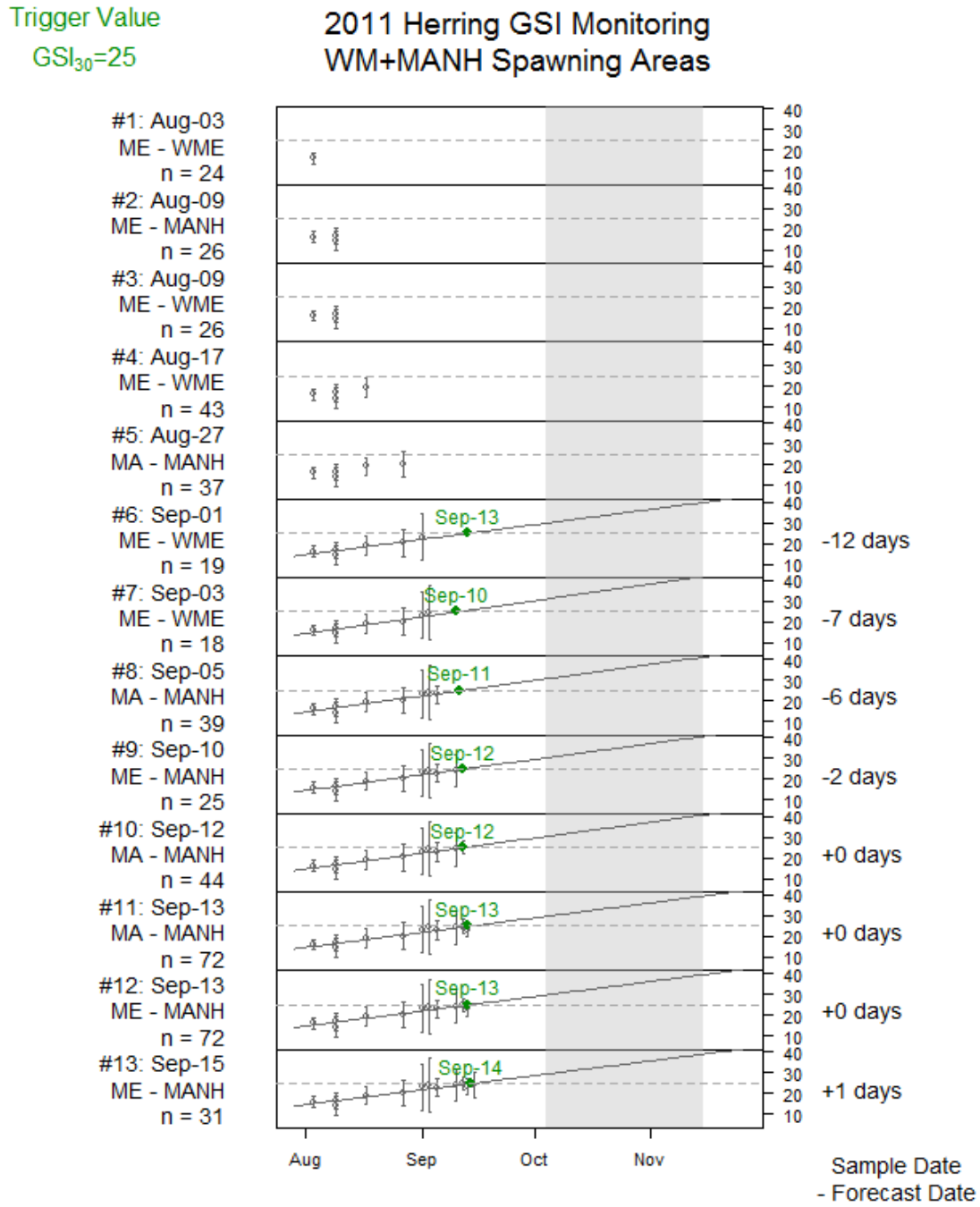

Predicted Default Closure Dates
WM + MANH spawning areas
Trigger Value
GSI30= 28
GSI30= 25
GSI30= 23
Oct-17
Oct-04
Sep-25
Sep 15
Oct 01
Oct 15
Nov 01
Nov 15

Figure 9. An example implementation of a modified GSI-based closure system using 2013 sample data from the MA-NH spawning area. A significant linear increase in GSI_{30} is detected after six samples (Sep-1st). Projecting this relationship forward, a closure date is forecast for Sep-13th. As additional samples are collected, the linear relationship and forecasted closure date are updated. If the choice was made to select a closure date at 5 days prior, a Sep 11th closure would have been announced on Sep 6th. The gray region identifies default t closure period associated with the trigger value used in this example (GSI_{30} = 25).



ATLANTIC STATES MARINE FISHERIES COMMISSION
Public Hearing Summary on Draft Amendment 3 to the Atlantic Herring Fishery Management Plan

January 25, 2016

Public hearings were held in Rhode Island, Massachusetts, New Hampshire, and Maine to solicit public comment on Draft Amendment 3 to the Atlantic Herring Interstate Fishery Management Plan. This document provides a tally of participant selected options on each issue by state. Additional context can be found in the summary of ASMFC led hearings at the end of the document. The Massachusetts public hearing summary will be provided in a separate document.

ISSUE 1. SPAWNING AREA EFFICACY

Section 4.2.6.1 Spawning Area Closure Monitoring System

Option A: Status quo – Sampling occurs by August 1 for Eastern and Western Maine, and by September 1 for Massachusetts/New Hampshire. It requires two 100 fish samples be collected from commercial catch. If samples are not available, default closure dates apply (see Section 4.2.6.2 for dates).

If sufficient samples are available, closures will occur 7 days after determination that female herring greater than 28 cm in length have reached a mean GSI of 20%; or female herring greater than or equal to 23 cm and less than 28 cm in length have reached a mean GSI of 15%.

Option B: Status quo with adjustments – The same as Option A, but samples can be collected from the commercial fishery or from fish surveys (e.g., fishery independent samples). In addition, the fishery will remain open if sufficient samples are available, and they do not contain female herring in ICNAF gonadal stages III – V.

Option C: GSI_{30} Based Forecast System – This system uses a completely new projection system that measures GSI standardized to a 30 cm fish. The length standardization eliminates the need to collect samples of various fish sizes, which is a limiting factor of options A and B. As a result, this option requires a minimum of three samples of 25 fish from either the commercial fishery or from fish surveys (e.g., fishery independent samples).

Spawning Area Monitoring System			
	Maine	**New Hampshire**	**Rhode Island**
Option A			
Option B			
Option C	**4 participants**		**1**

Section 4.2.6.2 Default Closure Dates

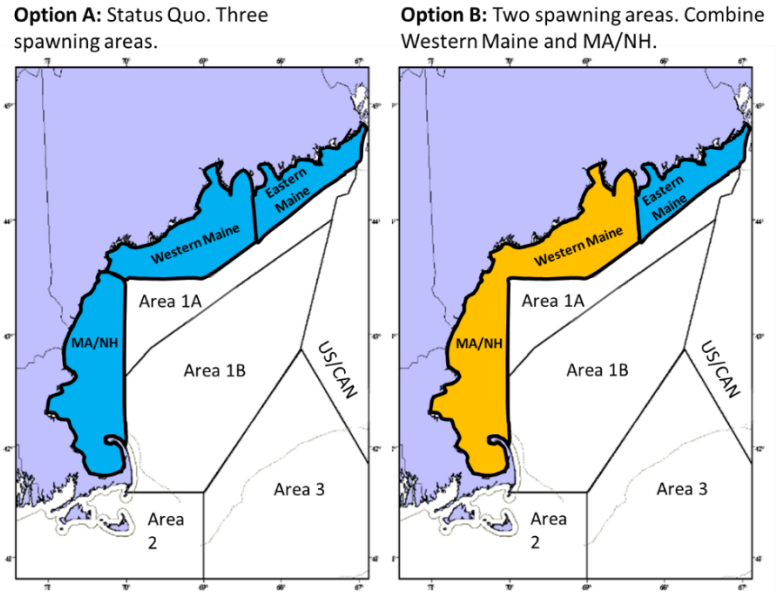
Each spawning closure monitoring system option outlined in the above section (4.2.6.1) has default closure dates if sufficient samples are not able to be collected by the default dates in the table below.

Spawning Area	A: Status Quo (and B: w/ adjustments)	C1:GSI_{30} trigger = 23	C2:GSI_{30} trigger = 25	C3:GSI_{30} trigger = 27
Eastern Maine	August 15	August 28	August 28	August 28
Western Maine (WM)	September 1	September 25	October 4	October 17
MA/NH	September 21	September 25	October 4	October 17
Tri-State (WM-MA/NH)	Not Applicable	September 25	October 4	October 17

Default Closure Date/GSI Triggers			
	Maine	**New Hampshire**	**Rhode Island**
Option A			
Option B			
Option C1			
Option C2		**1**	**1**
Option C3	**General consensus**		

Section 4.2.6.3 Spawning Area Boundaries

Technical analysis indicates there is no significant difference in the spawning onset times in Western Maine (WM) and Massachusetts/New Hampshire (MA/NH) area after adjusting to a standard 30 cm fish. Therefore, a two region option that combines WM, MA and NH is being considered to increase sampling range to inform closures (Option B below).



Spawning Area Boundaries			
	Maine	**New Hampshire**	**Rhode Island**
Option A	**Unanimous support**		
Option B			

Section 4.2.6.4 Spawning Closure Period

Data suggest the duration of herring spawning in a particular area is approximately 40 days. The current 4-week closure period (28 days) is inadequate to protect spawning fish. Therefore, an option to extend the closure period to 6-weeks (42 days) is being considered.

Option A: Status quo – By default, all spawning closures in all spawning areas selected under Section 4.2.6.3 will last four (4) weeks.

Option B: Six Week Closure – By default, all spawning closures in all spawning areas selected under Section 4.2.6.3 will last six (6) weeks.

Re-closure Protocol

Option A: Status quo – The 4-week spawning closure period will be extended for two more weeks if 25% or more of herring in a catch sample have yet to spawn at the end of the initial closure period.

Option B: Defined protocol – Same as option A, but it specifies one sample of 100 fish can be collected from either the commercial fishery or from fish surveys (e.g., fishery independent samples). Sampling will resume in the final week of the initial closure or at the end of the initial closure period.

Option C: No Re-Closure protocol – Samples will not be collected at the end of an initial closure period to inform the possibility of a re-closure.

Spawning Closure Period			
	Maine	**New Hampshire**	**Rhode Island**
Option A	**Unanimous support**	**1**	
Option B			
Re-Closure			
Option A			
Option B	**Unanimous support**	**1**	
Option C			

ISSUE 2. FIXED GEAR SET-ASIDE

Currently, any unused portion of the fixed gear set aside (up to 500 MT, but currently set at 295 MT) is rolled into the Area 1A quota on November 1. Anecdotally, Atlantic herring are available in the Gulf of Maine after November 1, therefore, fixed gear fishermen requested the set-aside be available through December 31.

Option A: Status quo – If the set-aside has not been utilized by the fixed gear fisheries west of Cutler by November 1, the remaining set –aside will be rolled into Area 1A until the directed fishery in 1A closes. If Area 1A quota has been reached by November 1, the set-aside will be released as part of the 5% incidental catch in Area 1A.

Option B: Remove rollover provision – The fixed gear set-aside will be available to fixed gear fishermen west of Cutler through December 31. Unused portions of the fixed gear set-aside will not be rolled over from one year to the next.

Fixed Gear Set-Aside			
	Maine	**New Hampshire**	**Rhode Island**
Option A			
Option B	**1**		

ISSUE 3. EMPTY FISH HOLD PROVISION

A provision that requires empty fish holds prior to trip departures is being considered to encourage harvest based on market demand.

Option A: Status quo – There would be no requirement to empty fish holds prior to a trip departure.

Option B1: Federal/State Empty Fish Hold Provision – This option mirrors the federal FMP, and is contingent on federal adoption. It requires fish holds on Category A/B Atlantic herring vessels be empty of fish before leaving the dock on any trip when declared into the Atlantic herring fishery. Exceptions would be granted through a waiver system for legitimate reasons (e.g., refrigeration failure) and waivers would not be needed for dock to dock transfers.

Option B2: Same as B1, but it is not contingent on federal adoption.

Option C1: Federal/State Empty Fish Hold Provision - Same as B1, but it only applies to vessels with the ability to pump fish. It is contingent on federal adoption.

Option C2: Same as B1, but it only applies to vessels with the ability to pump fish, and it is not contingent on federal adoption.

Empty Fish Hold Provision			
	Maine	**New Hampshire**	**Rhode Island**
Option A		**1**	
Option B1			
Option B2	**Multiple participants**		
Option C1			**2**
Option C2	**1**	**1**	

ATLANTIC HERRING PUBLIC HEARING MEETING SUMMARY

Augusta, Maine
January 6, 2016
21 Total Participants

Meeting Staff (5): Ashton Harp (ASMFC), Terry Stockwell (ME DMR), Matt Cieri (ME DMR), Pat Keliher (ME DMR), James Becker (ME DMR)

Meeting participants (16): Jennie Bichrest, Chris Weiner (ABTA/Choir), Dan Fill (Sprat Inc), John Stanley, Ed Dysarts (Dysarts), Roger Fleming (Earth Justice/ Herring Alliance), Michael Brewer (Ocean Venture), Shaun Rockett (F/V Western Sea), Kyle Molton (Penobscot East), Tim Tower (Burry Clark Corp), Glenn Robins (F/V Western Sea), David Osier (F/V Blue Water 101), Ben Matthews (B.M. Matthews Inc), Barry Matthews (B.M Matthews Inc, Ocean Venture), Dave Lenney (Tuna), Dana Rice

Issue 1: Spawning Area Efficacy

Issue 1.1: Spawning Area Monitoring System

Four participants favor *Option C. GSI30 Forecast Based Method*. One participant commented that if Option C is implemented then there is concern that a spawning area will be closed based on what we think (i.e. forecasting spawning onset), rather than we know (i.e. only closing when samples contain spawners). It was voiced that the method that can more accurately close a spawning area when fish are spawning should be used, and premature closures should be avoided.

General consensus that samples should come independent or dependent sample sources, rather than solely commercial samples (which is the status quo protocol).

A lobster fishermen commented that spawners are not desirable lobster bait—lobster will not enter traps if spawners are used as bait. In addition, the lobster fishermen indicated that he has seen less spawn herring being sold as bait in the past three years, therefore he is happy with the current system.

Two participants commented on the restrictive spawning regulations in Area 1A, compared to the other management areas (Area 1b, 2 and 3) where fishing on spawning areas is tolerated (i.e. there are no designated spawning areas).

Issue 1.2: Default Closure Dates

There was a general consensus in favor of *Sub-Option C3. 90th percentile trigger value*—this would alleviate a concern that was voiced in *Issue 1.1* that the fishermen do not want spawning areas closed prematurely. It was also voiced that this option is the closest option to a spawning tolerance.

Issue 1.3: Spawning Area Boundaries

Unanimous support for *Option A. Status Quo*—fishermen are satisfied with the current spawning area boundaries.

Issue 1.4: Closure Period

Unanimous support for *Option A. Status Quo*—fishermen are satisfied with the current 4 week closure period.

Issue 1.5: Re-closure Period

Unanimous support for *Option B. Refined Protocol*—fishermen would like sampling to resume prior to re-opening a spawning area to eliminate instances where the fishery is re-opened and then immediately closed for another two weeks. This is viewed as disruptive and costly.

Issue 2: Fixed Gear Set Aside Rollover Provision

One fixed gear fisherman was in favor of *Option B. Remove the Rollover Provision*. In the last three years he has not seen fish come into coves until after the Area 1A fishery is closed. Given he has been able to fixed gear fish prior to the closure recently, he would like the 295 mt to use when possible, year-round. He would also like to be able to sell herring 365 days a year given his limited access to the fishery in that past three years. He would also like the opportunity to fish starting in May (the fishery currently opens in June, this is a federal rule), when he regularly sees herring in the cove.

A lobster fishermen agrees that fixed gear fishermen should be allowed to start fishing in May and seconds the statement that herring do not appear in coves prior to the herring closure each year.

Issue 3: Empty Fish Hold Provision

One participant is in favor of *Option C2*, applying the empty fish hold provision only to those vessels that can pump and moving forward with the provision regardless of the federal decision.

Multiple participants were in favor of *Option B2*, using the NEFMC text and moving forward with the empty fish hold provision even if the NMFS does not approve the rule. In this instance the states would have to define an ‘empty fish hold’.

There was concern that inspection of each vessel prior to departure might delay trips. One participant said he thought the NEFMC text said “if a person is available” the vessel would be checked, however upon review of the text that is not accurate—all category A/B vessels will be checked.

Other Issues: Spawning Tolerance

Multiple participants discussed the benefit of reinstating a 20% tolerance for spawning fish in the fishery, potentially up to Oct 1 (therefore prior to mid-water trawlers entering the fishery). One participant suggested a ban on possessing stage IV-V spawning fish year round.

ATLANTIC HERRING PUBLIC HEARING MEETING SUMMARY

Portsmouth, New Hampshire
January 5, 2016
10 Total Participants

Meeting Staff (5): Ashton Harp (ASMFC), Doug Grout (NH F&G), Renee Zobel (NH F&G), Cheri Patterson (NH F&G), Fred Clews (NH F&G)

Meeting participants (5): Dennis Abbot (ASMFC Commissioner, Legislative Proxy), Ritchie White (ASMFC Commissioner, Governor Appointee), David Goethel (F/V Ellen Diane), Peter Baker (Pew Charitable Trusts/Herring Alliance), Patrice McCarron (Maine Lobstermen's Association)

Issue 1: Spawning Area Efficacy

Issue 1.1: Spawning Area Monitoring System

One participant was not in favor of any of the options, however it was voiced that samples should come from independent and dependent sources (rather than solely commercial catch samples).

Issue 1.2: Default Closure Dates

One participant noted that *Sub-Option C2 (GSI Trigger Value=25)* is the best option because the default dates more closely align with the actual spawning period. It was noted that WM and NH/MA should be closed after October 1, rather than September 21 as it is done now. C2 was seen as the trigger value that protects the majority of spawning fish, C3 was seen as far too late.

Issue 1.3: Spawning Area Boundaries

One participant was not in favor of either option, rather they would like there to be more spawning areas, not less. This would more accurately reflect the east to west spawning behavior.

Issue 1.4: Closure Period

One participant was in favor of *Option A. Status Quo* because it protects the majority of spawning fish.

Issue 1.5: Re-closure Period

One participant favored the *Option B. Re-closure Protocol*, but insists the language should require sampling "in the final week of the initial closure". In the current system sampling only happens after the spawning area re-opens, however a quick re-closure is very disruptive to the fishery.

Issue 2: Fixed Gear Set Aside Rollover Provision

One participant would like to see the fixed gear set aside removed entirely, meaning fixed gear fishermen should fish solely under the Area 1A sub-ACL with mobile gear fishermen.

Issue 3: Empty Fish Hold Provision

One participant is in favor of *Option A, status quo*—the act of checking vessels prior to departure was seen as too restrictive because it affects when and how fishermen sell their fish.

One participant is in favor of *Option C2* (empty fish hold provision for vessels that can pump, not contingent on federal adoption) it was seen as the best way to minimize dumping.

ATLANTIC HERRING PUBLIC HEARING MEETING SUMMARY

Narraganset, Rhode Island
January 4, 2016
7 Total Participants

Meeting Staff (3): Ashton Harp (ASMFC), Jason McNamee (RI DFW), John Lake (RI DFW)

Meeting participants (4): Meghan Lapp (Seafreeze Ltd.), Walter Anoushian (NOAA), Anthony Cherry (Pew Charitable Trusts/Herring Alliance), Robert Ruhle (F/V Darana R)

Issue 1: Spawning Area Efficacy

Issue 1.1: Spawning Area Monitoring System

One participant noted that *Option C (GSI30 Based Forecast System)* could be beneficial to the fishery, but it should be ground-truthed before it becomes the standard method. Two participants commented that relying on a minimum of 75 fish (i.e. at least 3 samples that have a minimum of 25 fish each) seemed relatively low. There was concern that a spawning area could be closed based on very small sample sizes. It was noted that the sample numbers are the minimum levels, and samples could be higher in practice.

Issue 1.2: Default Closure Dates

One participant noted that *Sub-Option C2 (GSI Trigger Value=25)* is the best option because it is in the middle. It was noted that it would be preferred to re-evaluate the trigger values over time instead of committing to one trigger value as a result of this amendment.

Issue 1.3: Spawning Area Boundaries

No comment

Issue 1.4: Closure Period

One participant noted that they are leery of using literature reviews to manage this fishery; a state pilot study to determine the average length of spawning should be performed using fisheries independent data during a spawning area closure.

Issue 1.5: Re-closure Period

One participant would like to know if the forecasting system can be used in reverse, for example, can samples be taken during a spawning area closure to determine when the appropriate date to re-open the fishery will be (i.e. instead of waiting 4 or 6 weeks).

Issue 2: Fixed Gear Set Aside Rollover Provision

No comment

Issue 3: Empty Fish Hold Provision

Two participants voted in favor of *C1 (Federal/State Empty Fish Hold Provision for Select Vessels*). Rhode Island vessels do not have the ability to pump, therefore the fishermen want to be excluded from the provision (which is an option under C1). The two participants noted that an empty fish hold provision would be completely impractical for this state.

- For example, one participant noted that they sell to a dealer by the truck load (40,000 lbs), but some days they only catch 10,000 lbs and then go out to sea the next day to catch another 30,000 lbs to meet the required 40,000 lb for a truck load. If the empty fish hold provision was enacted then it puts this fisherman's business at risk—he would have to always come to dock with exactly 40,000 lbs to avoid complications.
- For example, freezer vessels only unload once the freezer is full. However, they do come back to dock occasionally with a half empty hull if there is a mechanical failure or due to weather. Freezer vessels (which do not pump) do not pose a dumping threat because the fish are immediately processed on the boat.

ATLANTIC STATES MARINE FISHERIES COMMISSION
Written Comment Summary on Draft Amendment 3 to the
Atlantic Herring Fishery Management Plan

January 25, 2016

The following pages represent a summary of written comments received by ASMFC by January 20, 2016 at 5:00 p.m. on Draft Amendment 3 to the Atlantic Herring Interstate Fishery Management Plan.

A total of 9 written comments were received from the following organizations/groups:
Seafreeze Ltd., Rhode Island
Rhode Island Saltwater Anglers Association (RISAA)
Town Dock, Rhode Island
Cape Cod Commercial Fishermen's Alliance, Massachusetts (CCCFA)
Maine Lobstermen's Association, Inc. (MLA)
Penobscot East Resource Center, Maine (PERC)
F/V Starlight and F/V Sunlight
Ad Hoc Pelagics Coalition (AHPC)
The Pew Charitable Trusts (Pew)

ISSUE 1. SPAWNING AREA EFFICACY

Section 4.2.6.1 Spawning Area Closure Monitoring System

Option A: Status quo – Sampling occurs by August 1 for Eastern and Western Maine, and by September 1 for Massachusetts/New Hampshire. It requires two 100 fish samples be collected from commercial catch. If samples are not available, default closure dates apply (see *Section 4.2.6.2* for dates).

If sufficient samples are available, closures will occur 7 days after determination that female herring greater than 28 cm in length have reached a mean GSI of 20%; or female herring greater than or equal to 23 cm and less than 28 cm in length have reached a mean GSI of 15%.

Option B: Status quo with adjustments – The same as Option A, but samples can be collected from the commercial fishery or from fish surveys (e.g., fishery independent samples). In addition, the fishery will remain open if sufficient samples are available, and they do not contain female herring in ICNAF gonadal stages III – V.

Option C: GSI_{30} Based Forecast System – This system uses a completely new projection system that measures GSI standardized to a 30 cm fish. The length standardization eliminates the need to collect samples of various fish sizes, which is a limiting factor of options A and B. As a result, this option requires a minimum of three samples of 25 fish from either the commercial fishery or from fish surveys (e.g., fishery independent samples).

Spawning Area Monitoring System		
Option A	2	AHPC, F/V Starlight and F/V Sunlight
Option B	1	PERC
Option C	3	RISAA, Pew, PERC

Select sub-comment that provides additional context for chosen spawning area efficacy options, full text can be found in the individual written comments:

"We recommend the Section develop a pilot program that would parallel the new monitoring program and other proposed elements with the Status Quo and review these results in 2017. The Status Quo measures would remain in the interim." (*F/V Starlight and F/V Sunlight*)

Section 4.2.6.2 Default Closure Dates

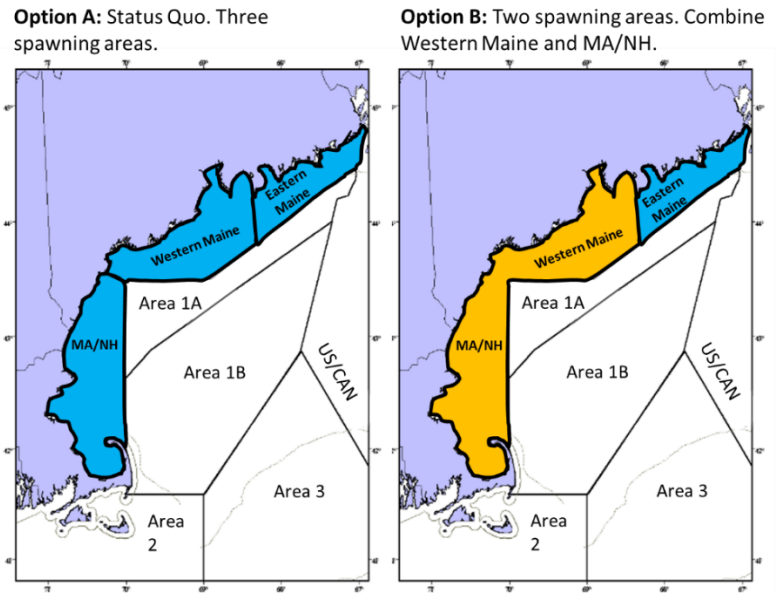
Each spawning closure monitoring system option outlined in the above section (4.2.6.1) has default closure dates if sufficient samples are not able to be collected by the default dates in the table below.

Spawning Area	A: Status Quo (and B: w/ adjustments)	C1:GSI_{30} trigger = 23	C2:GSI_{30} trigger = 25	C3:GSI_{30} trigger = 27
Eastern Maine	August 15	August 28	August 28	August 28
Western Maine (WM)	September 1	September 25	October 4	October 17
MA/NH	September 21	September 25	October 4	October 17
Tri-State (WM-MA/NH)	Not Applicable	September 25	October 4	October 17

Default Closure Date/GSI Triggers		
Option A	1	F/V Starlight and F/V Sunlight
Option B		
Option C1	2	RISAA, Pew
Option C2		
Option C3	1	AHPC

Section 4.2.6.3 Spawning Area Boundaries

Technical analysis indicates there is no significant difference in the spawning onset times in Western Maine (WM) and Massachusetts/New Hampshire (MA/NH) area after adjusting to a standard 30 cm fish. Therefore, a two region option that combines WM, MA and NH is being considered to increase sampling range to inform closures (Option B below).



Spawning Area Boundaries		
Option A	4	MLA, PERC, AHPC, F/V Starlight and F/V Sunlight
Option B	2	RISAA, Pew

Section 4.2.6.4 Spawning Closure Period

Data suggest the duration of herring spawning in a particular area is approximately 40 days. The current 4-week closure period (28 days) is inadequate to protect spawning fish. Therefore, an option to extend the closure period to 6-weeks (42 days) is being considered.

Option A: Status quo – By default, all spawning closures in all spawning areas selected under Section 4.2.6.3 will last four (4) weeks.

Option B: Six Week Closure – By default, all spawning closures in all spawning areas selected under Section 4.2.6.3 will last six (6) weeks.

Re-closure Protocol

Option A: Status quo – The 4-week spawning closure period will be extended for two more weeks if 25% or more of herring in a catch sample have yet to spawn at the end of the initial closure period.

Option B: Defined protocol – Same as option A, but it specifies one sample of 100 fish can be collected from either the commercial fishery or from fish surveys (e.g., fishery independent samples). Sampling will resume in the final week of the initial closure or at the end of the initial closure period.

Option C: No Re-Closure protocol – Samples will not be collected at the end of an initial closure period to inform the possibility of a re-closure.

Spawning Closure Period		
Option A	2	AHPC, F/V Starlight and F/V Sunlight
Option B	3	RISAA, CCCFA, Pew

Re-Closure		
Option A	2	RISAA, F/V Starlight and F/V Sunlight
Option B	1	Pew
Option C	1	AHPC

ISSUE 2. FIXED GEAR SET-ASIDE

Currently, any unused portion of the fixed gear set aside (up to 500 MT, but currently set at 295 MT) is rolled into the Area 1A quota on November 1. Anecdotally, Atlantic herring are available in the Gulf of Maine after November 1, therefore, fixed gear fishermen requested the set-aside be available through December 31.

Option A: Status quo – If the set-aside has not been utilized by the fixed gear fisheries west of Cutler by November 1, the remaining set –aside will be rolled into Area 1A until the directed fishery in 1A closes. If Area 1A quota has been reached by November 1, the set-aside will be released as part of the 5% incidental catch in Area 1A.

Option B: Remove rollover provision – The fixed gear set-aside will be available to fixed gear fishermen west of Cutler through December 31. Unused portions of the fixed gear set-aside will not be rolled over from one year to the next.

Fixed Gear Set-Aside		
Option A	1	F/V Starlight and F/V Sunlight
Option B	3	CCCFA, Pew, PERC

Select sub-comments that provide additional context for chosen fixed gear set-aside options, full text can be found in the individual written comments:

"We support allowing traditional fixed gear fishermen access to this quota until 1A closes (rather than making it available to other gear types), however we oppose rolling any unused quota for use in the next year." (*Pew*)

"More importantly, in addition to the rollover provision options as listed in the draft we would like to propose an additional option that would allow fixed gears to begin harvest of the quota set aside in Area 1A before June 1st, and instead starting the fixed gear season along the coast of Maine April 15th, May 1st, or even May 15th. This would improve opportunities for herring harvest by fixed gear fishermen during a season when there is considerable demand for fresh bait in the lobster/crab fishery and fixed gear fishermen would be best able to minimize bycatch of species like river herring in shoal waters." (*PERC*)

ISSUE 3. EMPTY FISH HOLD PROVISION

A provision that requires empty fish holds prior to trip departures is being considered to encourage harvest based on market demand.

Option A: Status quo – There would be no requirement to empty fish holds prior to a trip departure.

Option B1: Federal/State Empty Fish Hold Provision – This option mirrors the federal FMP, and is contingent on federal adoption. It requires fish holds on Category A/B Atlantic herring vessels be empty of fish before leaving the dock on any trip when declared into the Atlantic herring fishery. Exceptions

would be granted through a waiver system for legitimate reasons (e.g., refrigeration failure) and waivers would not be needed for dock to dock transfers.

Option B2: Same as B1, but it is not contingent on federal adoption.

Option C1: Federal/State Empty Fish Hold Provision - Same as B1, but it only applies to vessels with the ability to pump fish. It is contingent on federal adoption.

Option C2: Same as B1, but it only applies to vessels with the ability to pump fish, and it is not contingent on federal adoption.

Empty Fish Hold Provision		
Option A	1	Town Dock
Option B1		AHPC
Option B2	1	Pew
Option C1	1	Seafreeze
Option C2	1	F/V Starlight and F/V Sunlight

Select sub-comments that provide additional context for chosen empty fish hold provision options, full text can be found in the individual written comments:

PERC did not choose a specific option, but noted that they do not support Option A.

"They (dealers) will not send trucks for a partial load….Therefore it is important that they (fishermen) have the ability to take fish back out to sea." (*Town Dock*)

"Our freezer vessels sort, package, and freeze our catch at sea, and we have the ability to store processed product on board in our freezer holds for extended periods of time. If we are forced to cut a trip short for weather, mechanical failure, or other reasons, and do not have a full fish hold, we will go back out without unloading. This is due to the fact that the vessels incur unloading costs every time they offload, and it is not worth the cost for only a small number of boxes." (*Seafreeze*)

"This measure is proposed to help ensure that the Herring ISFMP remains consistent with federal herring fishery management plan. As such consistency is important to the industry, AHPC believes that the Herring Board should adopt an empty hold provision identical to that adopted by the National Marine Fisheries Service in Framework Adjustment 4 to the Atlantic Herring FMP when that framework is finalized." (*AHPC*)

Seafreeze Ltd.

100 Davisville Pier
North Kingstown, R.I. 02852 U.S.A.
Tel: (401)295-2585

January 11, 2016

Re: Comments on the Herring Draft Amendment 3

Dear Herring Section and Commission Members,

Seafreeze comments and concerns are directed towards Issue 3, the Empty Fish Hold Provision.

Our freezer vessels sort, package, and freeze our catch at sea, and we have the ability to store processed product on board in our freezer holds for extended periods of time. If we are forced to cut a trip short for weather, mechanical failure, or other reasons, and do not have a full fish hold, we will go back out without unloading. This is due to the fact that the vessels incur unloading costs every time they offload, and it is not worth the cost for only a small number of boxes. Because the product is processed and frozen, there is no urgency to unload. Therefore, product may remain on board without losing quality or value.

The purpose of the empty fish hold provision is to discourage the disposal of unsold fresh herring at sea. However, this objective is not applicable to our freezer vessel operations. We would never be dumping a processed product at sea. Therefore, such a requirement as required by Option B, would economically impact our freezer vessels unnecessarily.

With regards to fresh herring vessels, Option B also fails to recognize differences in vessel capabilities or operations. Our fresh vessel does not have an on board fish pump, and is therefore unable to dispose of fish at sea. Once the fish is in the RSW hold, it cannot be removed until a land-based pump pumps it out. If fish does remain in the hold, it is because of economic considerations but with the intent to sell at a later time; unloading can only occur at a dealer with a dock pump. All catch is accounted for through VTRs and dealer reports. However, fish is often sold in increments of "truckloads", which determines how much a vessel can unload at one time. If it is necessary to hold over a portion of the catch until the next day's trucks, the vessel must do so in order to be economically viable. The requirement of an empty fish hold should not apply to vessels without the capability of disposing of unsold fish at sea, or to vessels without the intent to do so. Neither should it render vessels unprofitable.

The empty fish hold provision is designed to mirror the New England Council's Herring Framework Adjustment 4, which contains a similar provision. These comments and concerns have also been submitted with regards to that proposed rule. However, no final rule on Framework 4 has yet been released. Therefore, we do not support taking a final Commission action that may result in conflicting regulations which would necessarily lead to confusion and the need for further Commission/Council action to modify or reconcile one or both documents.

Seafreeze supports and encourages the Commission to adopt Option C1, which takes into account these considerations.

Sincerely,

Meghan Lapp
Fishery Liaison, Seafreeze, Ltd.
100 Davisville Pier
North Kingstown, RI 02852
Tel: (401) 295-2585

RHODE ISLAND
SALTWATER
ANGLERS
Association

P.O. Box 1465, Coventry, Rhode Island 02816 401-826-2121 FAX: 401-826-3546 www.RISAA.org

January 19, 2016

Ashton Harp
1050 North Highland St., Suite 200 A-N
Arlington, VA 22201

RE: Draft Amendment 3

Dear Sirs,

The Rhode Island Saltwater Anglers Association (RISAA), representing 7,500 recreational anglers and 29 affiliate clubs, submits the following comments for Draft Amendment 3 to the Atlantic Herring Interstate Fishery Management Plan.

We support Option C of the Closure Monitoring System. Utilizing GSI (the herring spawning forecasting system) will help managers more accurately forecast when spawning will begin, in order for closures to be initiated to protect spawning, maturing fish. Under option C, we support the 70th percentile trigger value, the more conservative closure trigger, which offers more protection for pre-spawning and maturing fish.

In an effort to create a more inclusive spawning area, RISAA is in support of Option B. Combining the Western Maine and Massachusetts/New Hampshire areas will help increase the number of samples available to inform literature and data support for the closing and opening of spawning periods.

RISAA also supports Option B of increasing the current 4 week closure period to a 6 week closure period (Option B). The increase is consistent with what PDT recognizes as the 4 week period being inadequate because studies show the typical spawning period is 40 weeks. The extension to 6 weeks will ensure the spawning period for Atlantic Herring is complete during closure. However, if after the spawning period is not complete we support Option A of the re-closure protocol. This will ensure the proper growth of the Atlantic Herring population.

Thank you for your consideration on these important issues.

Respectfully,

Stephen J. Medeiros
Executive Director

January 20, 2016

Ashton Harp
1050 North Highland St.
Suite 200 A-N
Arlington, VA 22201

Dear Ms. Harp,

I am writing on behalf of the Town Dock to provide our comment regarding the "Empty Fish Hold" provision as it applies to Herring management.

The Town Dock is one of Rhode Island's largest seafood dealers. With over 100 employees, two processing plants, and seven owned fishing vessels we purchase millions of pounds of seafood each year from both local and out of state vessels and dealers.

We at the Town Dock support **Option A: Status Quo, no empty fish hold provision**. If one of our vessels needs to head back out to sea with fish on board it's because they weren't able to catch enough fish in one day to make it worth the trip for a truck to come and pack it out. The trucks are traveling from hundreds of miles away so they need to be able to completely fill the truck to make the trip worthwhile. They will not send a truck for a partial load.
There are times when we can take fish from several different vessels to fill the truck, but when that doesn't happen the vessel needs to be able to head back out to finish the trip so that the fish they do still have on board doesn't end up going to waste. Therefore it's important that they still have the ability to take fish back out to sea. Also, our vessels do not have pumps on board to be able to pump fish overboard at sea, so hopefully that relieves some concern.

Thank you for the opportunity to comment.

Sincerely,

Katie Almeida
Fishery Policy Analyst

The Town Dock: P.O. Box 608; 45 State St Narragansett, RI 02882
PH: 401-789-2200 FAX: 401-782-4421
Website: www.towndock.com

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Website: www.towndock.com

CAPE COD COMMERCIAL

FISHERMEN'S ALLIANCE

Small Boats. Big Ideas.

January 20, 2016

Douglas Grout, Atlantic States Marine Fisheries Commission Chair
1050 North Highland St.
Arlington, VA 22201

Dear Mr. Grout:

Thank you for the opportunity to comment on Amendment 3 of the Atlantic Herring Interstate Fishery Management Plan. The Cape Cod Commercial Fishermen's Alliance is a member-based nonprofit organization and is the leading voice for commercial fishermen on Cape Cod. We work extensively with the local fleet to advocate for management measures that support both prosperous fisheries and healthy oceans. We have consistently advocated for protective measures in inshore spawning areas and equitable accountability measures for the herring industry. We applaud the Atlantic States Marine Fisheries Commission (Commission) for working to strengthen measures already in place. We urge you to consider:

- *Issue #1: Improve spawning area efficacy in Area 1A.* As a forage fish, herring are important to our ecosystem and essential to thriving fisheries. We need to ensure a wide enough window for all herring to successfully spawn. It takes a school of herring approximately 40 days to complete the spawning processes. Therefore, a four-week closure is not ample enough to protect all spawning fish. A six-week closure is a better solution to ensure that this vital prey species can successfully reproduce.
- *Issue #2: Fixed gear set-aside provision.* We support extending access to the set aside quota for the fixed gear fleet for the entire year. The intent of the fixed gear set aside is to assure that the small-boat purse seine fleet would have access to its traditional fishery. It is a small amount of fish and should be preserved for that fleet at any time of year that herring are available.
- *Issue #3: Mandatory emptying of fish holds*. To improve Atlantic herring catch data, we need to account for all herring that is harvested and not simply what is landed. Discards should be counted towards the total allowable catch (TAC). Failure to hold fishing businesses accountable for discards provides little disincentive to avoid wasteful fishing practices.

Thank you for your attention to the matter. We look forward to working with the Commission to consider these options when reviewing the Atlantic Herring Amendment 3.

Sincerely,

Nick Muto
Chairman, Board of Directors

1566 Main Street, Chatham, MA 02633 (508)945-2432 info@capecodfishermen.org www.capecodfishermen.org

January 20, 2016

Robert E. Beal, Executive Director
Atlantic States Marine Fisheries Commission
1050 North Highland St., Suite 200 A-N
Arlington, VA 22201

RE: Draft Amendment 3 to the Atlantic Herring FMP

Dear Mr. Beal:

On behalf of The Pew Charitable Trusts, I submit these comments regarding the Atlantic States Marine Fisheries Commission's (ASMFC) Draft Amendment 3 to the Atlantic Herring Interstate Fishery Management Plan (Amendment 3). We commend the ASMFC for initiating this amendment to strengthen spawning protections for Atlantic herring in the Gulf of Maine. Protecting the forage base of the Northeast Shelf ecosystem, including Atlantic herring, is essential to successful fisheries management. While Pew supports many of the changes proposed in this amendment, we also strongly support and encourage ASMFC's continued focus on expanding protections for spawning Atlantic herring in the offshore areas of Georges Bank and Nantucket Shoals.

Specifically, Pew urges the ASMFC to:

- Approve and implement Amendment 3, particularly the measures developed to improve protection for spawning herring including: a spawning forecast system to improve the timing of closures, merging the Western Maine and Massachusetts-New Hampshire closures into a single tri-state area, extending the spawning closure periods to six weeks, and re-closing the spawning areas for two weeks if one catch sample shows herring are still in spawning condition.
- Approve and implement the requirement for fish holds to be empty of fish before vessels depart on a herring trip to reduce wasteful fishing and improve accounting of catch and bycatch, and remove the fixed gear set-aside rollover provision to allow fixed gear fishermen to maintain access to this dedicated quota throughout the fishing year.
- Immediately make a formal request of NOAA Fisheries and the New England Fishery Management Council (NEFMC) to use the best scientific information available to improve spawning protections for Atlantic Herring in the Omnibus Habitat Amendment (OHA2).

Enhancing spawning protections for Atlantic herring in the inshore Gulf of Maine
Pew recommends that the ASMFC approve Amendment 3 and adopt the following measures for implementation:

Issue 1: Spawning Area Efficacy

- **Spawning Area Closure Monitoring System: Option C (GSI_{30}-Based Forecast System).** We support the spawning forecasting system developed and recommended by the Herring Plan Development Team (PDT). This tool will help managers forecast when spawning will begin so closures can be triggered proactively and based on sound science to better protect schools of spawning herring. Under this option, we support the most conservative trigger proposed to inform the start of a closure (i.e., the 70th percentile GSI_{30} trigger value), which should offer more protection for herring in spawning condition, including aggregating and pre-spawning fish.
- **Default Closure Dates: Option C, Sub-Option C1 (70th Percentile, GSI_{30} Trigger = 23).** If sufficient samples are not available for informing closures, closures should continue as established by the default dates associated with the 70th percentile trigger value. Similar to above, establishing closures based on the 70th percentile value will result in earlier closure dates that should better protect pre-spawning activity. The ASMFC should also establish a system for obtaining herring samples from fishery-independent sources to supplement commercial sampling and decrease reliance on default closure dates.
- **Spawning Area Boundaries: Option B (Tri-State Spawning Area).**We support the PDT recommendation to combine the Western Maine and Massachusetts/New Hampshire spawning areas into a single tri-state area, which will simplify management and help increase the number of herring samples available to inform the timing of this closure.
- **Spawning Closure Period: Option B (Six Week Spawning Closure).** We support increasing the current four-week closure period to a six-week closure, or longer if justified, to better protect aggregations of spawning herring. This is consistent with the PDT's finding and recommendation that the current closure period is inadequate and should be increased based on studies in the Gulf of Maine showing that herring typically spawn over a 40-day period.[1] Closure periods longer than six weeks may be justified in light of a variable and changing climate which can affect the timing of fish migration and spawning, often in unpredictable ways. A new study by NOAA researchers suggests the rate of ocean warming in the Gulf of Maine (which is already warming faster than 99 percent of the world's oceans) may be greater than previously projected, likely leading to more extreme effects on the ecosystem.[2]
- **Re-closure Protocol: Option B (Defined Protocol).** We support resuming spawning closures for an additional two weeks if one sample shows that significant numbers of herring are in spawning condition. However, we question whether the threshold used to define significant spawning (i.e., 25 percent or more mature herring in a 100-fish sample) is conservative enough to trigger a re-closure that meets the objective of providing protection for spawning herring. As mentioned above, the ASMFC should incorporate fishery-independent sampling to improve the detection of spawning fish.

Issue 2: Fixed Gear Set Aside Provision Adjustment: Option B (Remove the rollover provision)

- We support the adjustment that allows traditional fixed gear fishermen to maintain access to dedicated quota (currently 295 mt) through the end of the fishing year. Currently, regulations allow up to 500 mt of the Area 1A allowable catch to be allocated to fixed gear fisheries

[1] ASMFC (Jan. 2015). Technical Report on Gonadal-Somatic Index-Based Monitoring System for Atlantic Herring Spawning Closures in US Waters, pgs. 3-5.

[2] Saba, V. S., et al. (2015). Enhanced warming of the Northwest Atlantic Ocean under climate change, J. Geophys. Res. Oceans,120; also see NOAA press release: http://www.nefsc.noaa.gov/press_release/pr2016/scispot/ss1601

operating in Area 1A until November 1st before the remaining set-aside is made available to other gear types. Fixed gear fishermen in Maine have requested access to this dedicated quota until the directed fishery in 1A closes. The PDT concluded there is no biological basis for or against adjusting the rollover provision, however issues associated with providing this quota in late fall to the midwater trawl fleet, where it could be utilized in ecologically important areas such as Ipswich Bay, were identified at the public hearings. We support allowing traditional fixed gear fishermen access to this quota until 1A closes (rather than making it available to other gear types), however we oppose rolling any unused quota for use in the next year.

Issue 3: Empty Fish Hold Provision. Option B2 (State Empty Fish Hold Provision).

- We support a requirement for Atlantic herring vessels (Category A/B) to have fish holds empty of fish prior to departing on a declared herring fishing trip, not contingent on federal adoption. As indicated in the amendment this provision aims to "to reduce waste from fishing…[and] benefit bycatch species, such as river herring, through better catch data and monitoring by preventing mixing of catch from multiple trips."[3] This measure is consistent with the empty fish hold provision approved and recommended by the New England Fishery Management Council (NEFMC) in Framework 4 to the Atlantic Herring FMP.

Advancing offshore spawning protections for Atlantic herring

In addition to addressing the management issues discussed above, we urge the ASMFC as part of Amendment 3 to request NOAA Fisheries and the NEFMC to take immediate action to institute offshore protections for spawning Atlantic herring on Nantucket Shoals and Georges Bank. Scientists widely recognize that Atlantic herring persist as a meta-population made up of multiple distinct groups. Thus, the protection of each spawning component is critical to ensure the stability and successful management of this important resource throughout the Northeast Large Marine Ecosystem. The importance of offshore spawning protection is further underscored by research demonstrating that the recovery of herring on Georges Bank, which collapsed in the mid-1970s, was due to recolonization from nearby spawning components in the Gulf of Maine and Nantucket Shoals.[4]

Protection of spawning herring, including offshore components, has been a priority of the ASMFC since it first initiated closures in 1994 as part of the 1993 Atlantic Herring FMP. Recently, the ASMFC has explored the potential for an offshore spawning study to inform spawning management in federal waters, and requested the collaboration and support of the NEFMC, the Greater Atlantic Regional Fisheries Office (GARFO) and Northeast Fisheries Science Center. As noted in its request dated April 14, 2014: [5]

[3] ASMFC (Jan. 2016). Public Hearing Document For Draft Amendment 3 To The Atlantic Herring Interstate Fishery Management Plan For Public Comment. pg. 24.

[4] Petitgas *et al*. (2010). Stock collapses and their recovery: mechanisms that establish and maintain life-cycle closure in space and time. – ICES Journal of Marine Science, 67: 1841–1848; Stevenson DK, Scott ML (2005). Essential fish habitat source document: Atlantic herring, Clupea harengus, life history and habitat characteristics (2nd edition). NOAA Tech Memo NMFS NE 192, 84 p; Overholtz, W. J., and Friedland, K. D. (2002). Recovery of the Gulf of Maine –Georges Bank Atlantic herring (Clupea harengus) complex: perspectives based on bottom trawl survey data. Fishery Bulletin US, 100: 593 –608.

[5] Letter to NEFMC Executive Director Tom Nies from ASMFC Executive Director Robert Beal, dated April 14, 2014

…spawning fish must be protected not just near the coast, but in offshore waters as well, to ensure long-term sustainability of sea herring."

However, to date, it appears no further progress has been made on advancing this proposal to study and better protect spawning herring in offshore waters. The ASMFC and its federal partners should immediately prioritize this work and continue to aggressively seek funding and collaboration through government, industry, private foundations or other sources.

As we emphasized in our comments on the Public Information Document for Draft Amendment 3,[6] the most immediate opportunity to protect spawning herring is through the NEFMC's Omnibus Habitat Amendment (OHA2). However, the OHA2, as proposed to NOAA Fisheries by the NEFMC, offers little protection for well-known herring spawning areas, particularly on Georges Bank and Nantucket Shoals. We have commented on the deficiencies in the NEFMC's approach to spawning throughout the development of the OHA2, most recently in letters to the NEFMC in March and June 2015.[7] In our comments, we urged the NEFMC to take an integrated view of habitat protection, seeking out habitat areas that could achieve multiple goals, including protection of herring spawning aggregations and their eggs. For example, the OHA2 contains a number of habitat alternatives that would, with appropriate management, protect spawning Atlantic herring (See Appendix, Figure A1). Among these, Alternative 8 for Georges Bank is in a vital offshore herring spawning area. The OHA2 also contains options in Downeast Maine and the Great South Channel that could also improve a region-wide program for protection of these vital forage fish.

Such protections should be added to the NEFMC's OHA2, which the NEFMC recently submitted to NOAA Fisheries for review. Substantially all of the necessary data and analysis is already contained in the OHA2 and its accompanying EIS. Alternatively, although it would likely delay these needed protections and be less efficient, a new trailing action to OHA2 could instead be initiated and expedited to add these protections.

The vitality of the remaining offshore spawning groups is essential to the regional marine environment and to the re-establishment of near-shore spawning groups. The current lack of protections for these spawning components represents an outdated and risk-prone approach to managing for the long-term health of the herring resource. Special attention to Atlantic herring spawning, including coordination with the NEFMC in federal waters, is well aligned with the ASMFC's Five-Year Strategic Plan (2014-2018).[8] Accordingly, we strongly encourage the ASMFC to immediately make a formal request of GARFO and the NEFMC to use the best scientific information available to improve the spawning protections for Atlantic Herring in the OHA2 before it is adopted into regulation.

Thank you for the opportunity to comment on the Draft Amendment 3 to the Atlantic Herring FMP. We look forward to working with ASMFC on proactive and precautionary long-term management of herring

[6] Letter to ASMFC from Pew re: Draft Amendment 3 PID, dated July 10, 2014.
[7] Letter to Council chair Terry Stockwell and Regional Administrator John Bullard, from Pew et. al., dated June 10, 2015; Letter to Council Executive Director Tom Nies from Pew, dated March 17, 2015
[8] ASMFC Five-Year Strategic Plan 2014-2018

and other forage fish to ensure the health and productivity of the Atlantic coast marine ecosystem is maintained.

Sincerely,

Peter Baker
Director, U.S. Oceans, Northeast
The Pew Charitable Trusts

cc:
Mr. John Bullard, Regional Administrator
NOAA Fisheries Service, Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930

Thomas J. Nies, Executive Director
New England Fishery Management Council
50 Water Street, Mill 2
Newburyport, MA 01950

Appendix: presented to the NEFMC February 20, 2014 as part of a comment letter on the Omnibus Habitat Amendment.

Appendix II: Forage Fish

Food: Atlantic herring EFH. Atlantic herring, their spawning grounds and other critical areas, must be protected as EFH. Herring is a keystone species within the Northeast U.S. Continental Shelf large marine ecosystem,[9] serving a vital role as food for many of the region's most prized fish including Atlantic cod, haddock, and bluefin tuna. Herring also provide essential sustenance for other species under the stewardship of NOAA Fisheries, including whales and other mammals protected by both the ESA and the Marine Mammal Protection Act (MMPA). The influence of herring and a second major food source, sand lance, on the spatial distribution of cod was a focal point for a new analysis during the recent cod stock assessment. These two forage fish can represent over half of the adult cod diet and thus the places where these two forage species occur drive the spatial and temporal distributions of cod and other predators. When sand lance is in high abundance on Stellwagen Bank, cod concentrate there in places referred to as *forage hotspots* in the Gulf of Maine cod stock assessment.[10] At other times, cod redistribute themselves in the Western Gulf of Maine when feeding on herring. A recent peer reviewed study in the Proceedings of the National Academy of Sciences showed that not only are adult herring vital as food for cod and other groundfish, but their eggs and larvae are a major source of food for haddock.[11]

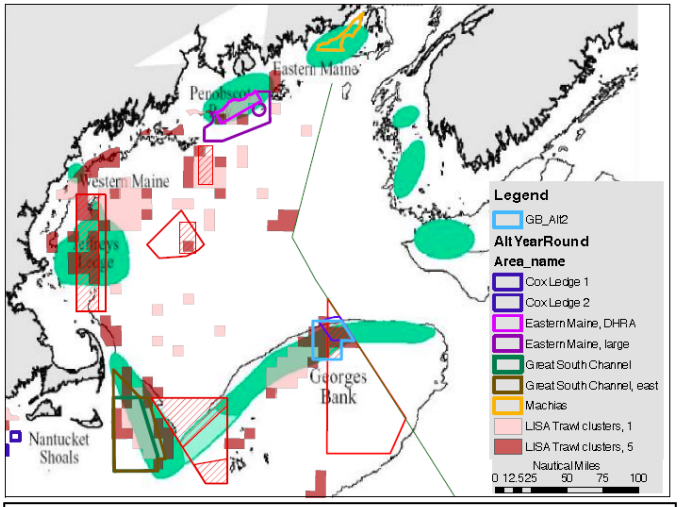

Figure A1. Spawning areas of Atlantic herring (green) shown together with SASI/LISA areas, existing EFH areas, and some of the DEIS alternatives. Spawning areas reproduced from the most recent stock assessment (SAW/SARC 54, 2012).

[9] Overholtz; Richardson DE et al (2010) ICES; Read and Brownstein, 2003; Brandt and McEvoy, 2006; Overholtz and Link, 2007.

[10] Gulf of Maine Atlantic Cod (*Gadus Morhua*) Stock Assessment For 2012, Updated Through 2011. 55th SAW Assessment Report. Northeast Fisheries Science Center Reference Document 13-11

[11] Richardson DE et al (2011) Role of egg predation by haddock in the decline of an Atlantic herring population. Proceedings of the National Academy of Sciences, 108 (33):13606–13611

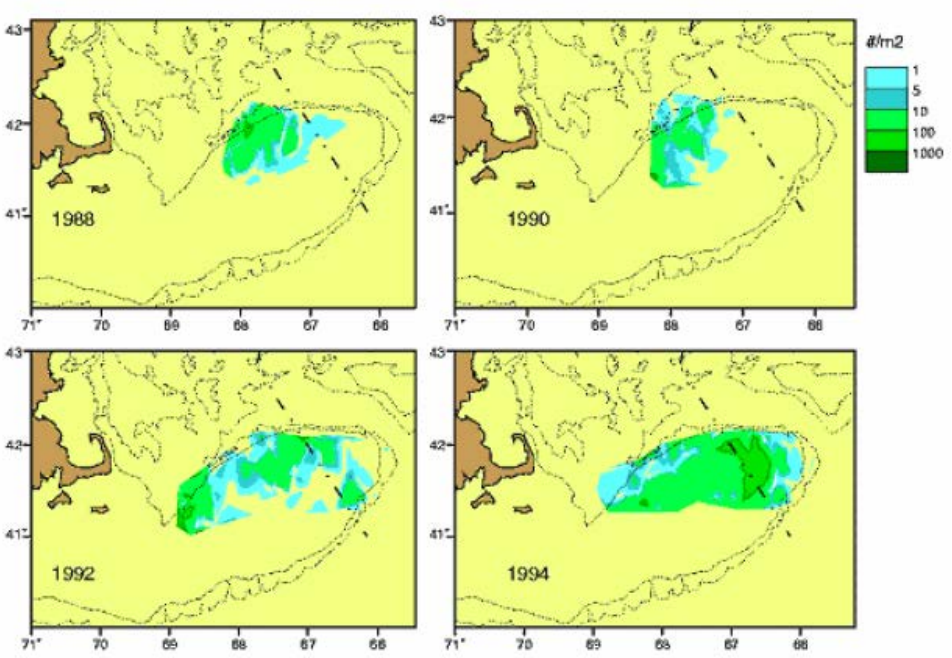

Figure A2. Distribution of recently hatched Atlantic herring on Georges Bank. Reproduced from EFH source document, NOAA Technical Memorandum NMFS-NE-192 (2005)

Atlantic herring form shoals during site-specific spawning behavior. In some cases, these shoals are vast (e.g., 250 million herring on the Northern Edge of Georges Bank at one time),[12] making the fish especially vulnerable to fishing at this critical life stage. Herring eggs are adhesive, sinking to the bottom where they adhere to rocks, pebbles, gravel, or shell beds selected for spawning, and form dense egg-mats.[13] Thus, not only are aggregated adults vulnerable to fishing during spawning but so too are the eggs on the bottom. Any gear contacting the bottom will disturb the eggs, particularly mobile gears such as otter trawls, clam dredges, and mid-water herring trawls. Herring spawning in a given locality may have a dominant time in the year, but spawning can occur at many different times year, from early spring through late fall in the Northeast. Management should be designed to ensure that even small spawning contingents are not inadvertently extirpated by fishing, which makes the population as a whole more vulnerable, and reduces the availability of herring as food (i.e., eggs, larvae, juveniles and adults) in space and time.

Distinct spawning groups of Atlantic herring have been documented over the past century as illustrated in the map above, reproduced from the most recent herring stock assessment (Figure A1).[14] This map does

[12] Makris NC et al (2009) Critical Population Density Triggers Rapid Formation of Vast Oceanic Fish Shoals. Science **323**: 1734-1737.

[13] Reviewed in Collette and Klein-MacPhee 2002

[14] Figure A4- 3 reproduced from SAW/SARC 54 Stock Assessment of Atlantic Herring – Gulf of Maine/Georges Bank For 2012, Updated through 2011: *Generalized view of the current major herring spawning areas in the Gulf of Maine and on George Bank;* an identical map is included as Figure 3 of the Essential Fish Habitat Source Document: Atlantic Herring, *Clupea harengus*, Life History and Habitat Characteristics. Second Edition, 2005. NOAA Technical Memorandum NMFS-NE-192.

not capture a number of small near shore spawning localities, some of which may no longer exist, nor the spawning areas documented along the southern edge of Georges Bank.[15]

Both the EFH management areas and the measures adopted for them must ensure that the spawning grounds for Atlantic herring are afforded sufficient protection to ensure spawning success for herring throughout the year. Herring spawning is driven by specific conditions of the substrate and water flow and use of particular places has waxed and waned throughout recent history. Management should allow for reestablishing spawning in areas where spawning may be minimal today.

Food: Sand lance as EFH. Sand lance is widely recognized as another vital forage species in the region, supporting marine mammals, seabirds, cod and other fish important to commercial and recreational fisheries. As noted in the discussion of Atlantic herring above, studies done for the Gulf of Maine cod stock assessment indicate that cod aggregate on Stellwagen Bank to feed on sand lance when abundant.[16]

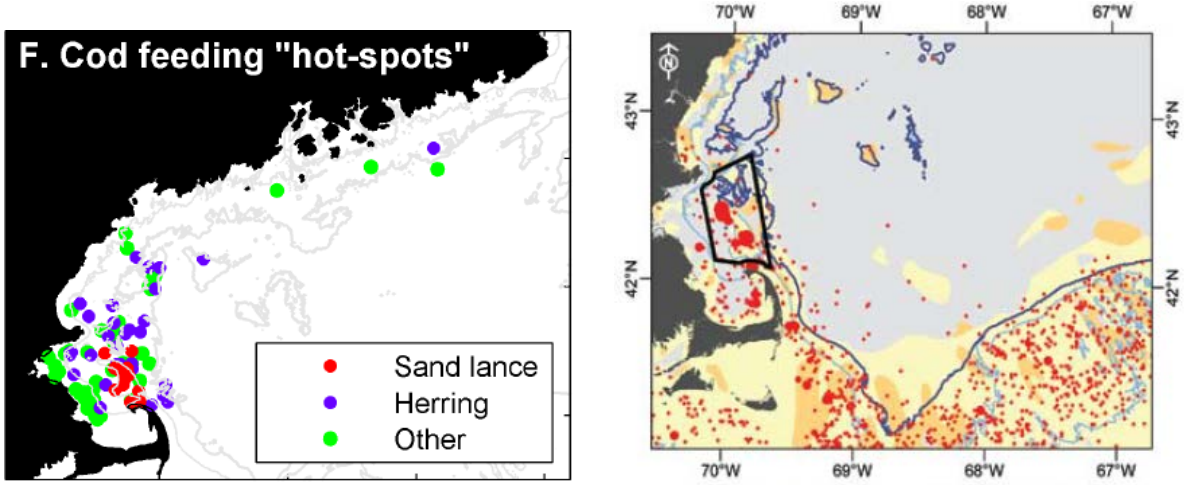

Figure A3. The left panel shows data on cod feeding based on stomach contents and the right panel depicts the distribution of sand lance, an important forage fish; abundance is proportional to the diameter of each red point (1975-2000).

With other historically important forage fishes diminished in the region (e.g., river herring and shad), the role of Atlantic herring and sand lance are particularly important. Analysis of the stomachs of cod has revealed that Stellwagen Bank is a foraging hotspot for sand lance consumption (Figure A3 left).[17] The map above (Figure A3 right) shows the distribution of sand lance in Southern New England including Massachusetts Bay, Stellwagen and Georges Banks and the Nantucket Shoals area.[18] Areas within Massachusetts and Cape Cod Bays, Georges Bank and points south which support high abundances of

[15] See Overholtz et al (2004) Stock Assessment of the Gulf of Maine - Georges Bank Atlantic Herring Complex, 2003. Northeast Fisheries Science Center Reference Document 04-06.

[16] Gulf of Maine Atlantic Cod (*Gadus Morhua*) Stock Assessment For 2012, Updated Through 2011. 55th SAW Assessment Report. Northeast Fisheries Science Center Reference Document 13-11; Richardson, DE, Palmer MC, Smith B. 2012. The relationship of forage fish abundance to aggregations of Gulf of Maine Atlantic cod (*Gadus morhua*) and possible implications for catch-per-unit-effort indices. SAW 55 Data Meeting. August 27-31, 2012. Working Paper 4. 41 p.

[17] Slide from Presentation by Michael Palmer, March 4, 2013. *Gulf of Maine Cod: From Bankers' Hours to Bankruptcy and the Role of Fine Scale Spatial Dynamics on Stellwagen Bank*

[18] Figure 50, page 102, Stellwagen Bank National Marine Sanctuary Final Management Plan and Environmental Assessment (2010).

sand lance should be integral to an effective EFH management plan, including protection from mobile bottom tending gear, and any gear capable of catching sand lance.

Food: River herring and shad as EFH. The fate of the once abundant river herring and shad species (alosines) has received considerable attention at all the East Coast management bodies including Atlantic States Marine Fisheries Commission (ASMFC), Mid-Atlantic Fishery Management Council (MAFMC) and the NEFMC, and in a recent ESA listing decision by NOAA. Extensive work has been carried out examining the incidental catch of these forage species in ocean fisheries, including examination of places and times when at-sea mortality is highest.[19] Although this work has revealed discrete areas where large incidental catch events occur, there is no consideration of these alosine fishes within the context of the regional forage mosaic and the EFH DEIS. With adequate protection, alosines could again become a more important part of the regional forage base.

Food: Protecting forage species for which directed fisheries do not yet exist. Recognizing the keystone role of forage species in ocean ecosystems, the North Pacific Fishery Management Council began establishing policies regulating the development of new fisheries for forage species in 1998 with additional amendments in 2010.[20] The Pacific Council is following this example with its *Unmanaged Forage Fish Protection Initiative* and is in the process of establishing similar regulations, which represents a forward looking step to ensure a future for its fisheries.[21] New England and the Mid-Atlantic managers must follow suit. The MAFMC is already developing approaches for addressing this important issue.[22] Along with sand lance discussed above, there are other species that should be put off limits to directed fishing through the EFH amendment. These include river herring and shad, krill, shrimp, and copepods, all vital food sources in the regional ecosystems.

[19] Cournane JM et al (2013) Spatial and temporal patterns of anadromous alosine bycatch in the US Atlantic herring fishery. Fisheries Research **141**:88– 94.

[20] See Final Rule implementing Amendments 36/39 to the NPFMC Groundfish FMP's at www.fakr.noaa.gov/frules/3639fr.pdf. This action identified and protected over 20 important forage species in 9 scientific families by prohibiting directed fishing on those species; 30 50 CFR 679; June 2004 PFMC Meeting. Exhibit G.4.a Situation Summary; Final Environmental Assessment for Amendments 87/96 to the NPFMC Groundfish FMP's at http://alaskafisheries.noaa.gov/sustainablefisheries/amds/95-96-87/final_ea_amd96-87_0910.pdf; Final Rule implementing the Arctic FMP at www.fakr.noaa.gov/frules/74fr56734.pdf

[21] Ecosystem Plan Development Team Report on Authorities to Protect Unfished Species from Future Directed Fisheries. EPDT Report, June 2012 (Agenda Item G.1.b); Situation summary: Unmanaged Forage Fish Protection Initiative (I2_SITSUM_SEPT2013BB); Decision Summary Document Pacific Fishery Management Council September 12-17, 2013: *Unmanaged Forage Fish Protection Initiative*, available at www.pcouncil.org/wp-content/uploads/0913decisions.pdf;
Supplemental Ecosystem Workgroup Report: Ecosystem Workgroup Report on Unmanaged Forage Fish Protection Initiative (Agenda Item I. 2.b), PFMC, September 2013 (I2b_SUP_EWG_SEPT2013BB);

[22] Approaches for Unmanaged Forage Species. Staff Memorandum to Executive Director Moore, MAFMC, February 3, 2014, Executive Director's Report, MAFMC Meeting, Briefing Materials (Tab 10), New Bern, NC February 11-14.

MAINE
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Atlantic States Marine Fisheries Commission
Ashton Harp
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Arlington, VA 22201

Dear Ashton:

The Maine Lobstermen's Association (MLA) is providing comments on the proposals under consideration in the Draft Amendment 3 to the Atlantic Herring IFMP document. MLA is Maine's oldest and largest fishing industry organization whose mission is to advocate for a sustainable lobster resource and the fishermen and communities that depend on it.

Maine's lobster industry is worth well over a billion dollars and our coastal economy depends on its success. In 2014, Maine's 5,000 lobstermen landed nearly 125 million pounds for the third year in a row, valued at more than $450 million. Maine lobster accounted for nearly 80% of the value of all seafood landed in Maine and is by far our state's most valuable fishery. While official statistics are not yet available for 2015, industry feedback has indicated that the 2015 has been another strong and profitable year for Maine lobstermen.

Maine lobstermen are the primary consumers of Atlantic herring. Fresh herring continues to be the preferred bait choice of most Maine lobstermen and many depend solely on herring to bait their lobster traps. Lobstermen need bait to fish, therefore the MLA has a strong, vested interest and sustaining the herring stock and herring fishery over the long-term.

The MLA supports the premise of Draft Amendment 3 – we want to see effective measures in place to protect the spawning stock to help ensure the long-term sustainability of the herring resource and fishery. As noted in the public hearing document, the herring stock has rebuilt since the 1990's and there is now a broad range of age classes with older and larger fish when compared to the stock during overfished conditions. Therefore, it appears that the existing management plan has been effective and there is no pressing need to make changes unless they further improve the health of the herring stock in a manner that does not negatively impact the harvest of the resource and a steady bait supply.

The ASMFC's work to manage the herring fishery significantly and directly impacts Maine's lobster fishery. For example, during the 2015 fishing season, the bait supply experienced many

interruptions, which cost the lobster fishery time and money. The second trimester Area 1A fishery had been predicted to last through September but was closed abruptly on August 28; the third trimester 1A fishery barely lasted one month closing in early November; the Area 3 fishery was closed on October 22; and the inshore spawning closures were in place coast-wide from August 15 to November 4. The impacts of these combined factors on Maine's lobster fishery included a short-term lack of bait for some lobstermen resulting in time out of the fishery. Most of these lobstermen had to scramble to find alternate bait sources in order to resume fishing. And most lobstermen along the Maine coast experienced spikes in the price of bait due to the unexpected lack of supply.

Spawning herring need to be protected to ensure the continued sustainability of the fishery. The MLA has long supported spawning protections, particularly the earlier program that included a 20% tolerance. This approach worked well for Maine and allowed for strong protections of spawning herring with the least interruption to the fishery. It is important to consider how all of the management requirements combine to affect the herring fleet's ability to catch fish during the period when demand for bait is highest. It has been challenging under the current management structure to keep a steady supply of herring landings during the late summer and fall months.

With regard to the specific proposals in draft Amendment 3, the MLA does not feel that we have enough information to confidently support one proposed option over another. The MLA would support the option that has the least interruption to the commercial fishery (4 week closures versus 6 week closures) if it provides adequate protection for the fish. To ensure the least interruption of the bait supply, the MLA would support a four week closure with sampling during the last week of the closure to determine if it should be extended for an additional two weeks. Under this scenario, the samples should be obtained in a timely manner so that the closure remains in place without interruption.

The MLA does support the additional flexibility proposed in several of the options to obtain fish samples from outside the commercial fishery to provide flexibility and help ensure that adequate samples are obtained if the herring fleet is not operating in a particular area.

The MLA did not see any justification in the document to change the spawning area boundaries.

Finally, the MLA is concerned about the reported dumping of unsold herring at sea if there is a bottle neck in the supply chain when the fish are landed. The demand for fresh herring is very strong in the Maine lobster industry and there is a strong market for every single herring that is landed. The MLA supports implementing provisions to prevent the dumping of fish, and requiring an empty fish hold prior to trip departure could address this issue. However, it is important to engage the herring fleet directly in this discussion as they are the ones involved in the harvest and sale of those fish and may be able to provide alternate solutions to address this issue.

Overall, the herring stock has rebuilt and is stable. We applaud the Commission for seeking out options to further improve the overall health of the herring fishery. Given the lobster industry's strong dependence on the Atlantic herring fishery for our bait supply, please carefully consider the implications of further interrupting the herring fishery since this will greatly impact the Maine lobster fishery during the late summer and fall months.

Thank you for your consideration of these comments.

Sincerely,

Patrice McCarron
Executive Director

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Securing a future for fishing communities

January 20, 2016

Ashton Harp
1050 North Highland St.
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Arlington, VA 22201

RE: Atlantic Herring IFMP Draft Amendment 3 Comments

Dear Ms. Harp,

I write to comment, on behalf of Penobscot East Resource Center in Stonington, Maine, regarding the draft Amendment 3 to the Atlantic Herring Interstate Fisheries Management Plan. Penobscot East works with community fishermen throughout eastern Maine to foster diversity in fishing opportunities and build vibrant coastal communities. Most fishermen we work with are owner operators and many participate in a variety of state and federal fisheries. Thank you for the opportunity to submit our comments.

Broadly, we are pleased that Amendment 3 highlights the following objectives; to prevent overfishing of discrete spawning units and to provide adequate protection for spawning herring. We are also pleased to see language considering herring's value as a forage species. Recent research has shown that many traditional inshore spawning groups of groundfish like cod and haddock depended on lipid-rich prey like Atlantic herring and alewives (Ames and Lichter, 2012), and their depletion is at least in part, due to a lack of adequate energy-dense forage. If depleted stocks like Gulf of Maine cod, particularly inshore spawning groups, are to be rebuilt one of the first steps needs to be ensuring adequate, reliable forage that cod need to thrive.

Specifically, in Section 4.1.1 we do **not** support Option A, status quo. Either of the alternatives is preferable as they allow for greater flexibility in data that can be used to make decisions to close spawning areas. It is unacceptable that valid biological samples would not be considered because they are not samples from a participant in the directed herring fishery. Scientific sampling, samples collected in other fisheries, and even fishermen and/or community input should all have a role in this decision making process and status quo doesn't provide the necessary flexibility to include guidance from these sources.

In Section 4.1.3 we support Option A, status quo. We do not support combining smaller areas together for management convenience. Research in herring and other fisheries has shown that fine scale dynamics of fish stocks including discrete spawning aggregations and regional differences in conditions warrant management at finer, not broader scales. Combining the Western Maine and Mass/New Hampshire spawning closure areas would be a step in the wrong direction and contrary to recent science. The complexity of the system and differences in conditions across Area 1A warrant at least the current level of geographic division, if not greater.

We support Option B under Section 4.2, removing the rollover provision for the fixed gear set-aside. Historically, much of the herring fishery occurred in inshore, shoal waters using fixed gear like weirs and stop seines, which only accessed a small portion of the Atlantic herring resource. Today, mobile gears have increased the capacity of the fishery significantly, but opportunities for fixed gear fishermen remain limited. The opportunistic nature of fixed gear herring fishing coupled with changing ocean conditions make flexibility for this historic and highly selective gear of paramount concern. Increasing opportunities for fixed gears will promote utilization by local fishermen, in sync with local markets, supported by traditional diverse participation in the fishery, while promoting conservation of the resource. More importantly, in addition to the rollover provision options as listed in the draft we would like to propose an additional option that would allow fixed gears to begin harvest of the quota set aside in Area 1A before June 1st, and instead starting the fixed gear season along the coast of Maine April 15th, May 1st, or even May 15th. This would improve opportunities for herring harvest by fixed gear fishermen during a season when there is considerable demand for fresh bait in the lobster/crab fishery and fixed gear fishermen would be best able to minimize bycatch of species like river herring in shoal waters. This option would increase utilization of the set aside by fixed gear fishermen, help fill a high value seasonal and local market, as well as minimize bycatch of non-target species.

Under Section 4.3 we do **not** support Option A, status quo. We would like to see steps to improve fishery data and reduce unnecessary herring discards like those in the other Options. The management of this resource should not promote the discarding of dead herring that could otherwise be utilized in a variety of markets. In particular, bait is a major concern for Maine's lobster fishery and full utilization of all herring harvested should be strongly encouraged. Given the importance of herring to the Gulf of Maine ecosystem and the existence of markets hungry for herring, discarding and misreporting should be tackled head on. Full utilization will increase the accuracy of herring data collection.

Thank you for the opportunity to provide our comments. We look forward to working with ASMFC and NOAA toward a sustainable fishery for Atlantic herring, and for the Gulf of Maine ecosystem that depends on a healthy herring resource.

Sincerely,

Kyle J. Molton
Policy Director
Penobscot East Resource Center

GehanLaw
The Law Office of Shaun M. Gehan

January 20, 2016

Via Electronic Mail

Ashton Harp
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Arlington, Virginia 22201

RE: Comments on Amendment 3 to the Interstate Fishery Management Plan for Atlantic Herring

Dear Ms. Harp:

These comments on Amendment 3 to the Interstate Fishery Management Plan ("ISFMP") for Atlantic Herring are submitted on behalf of the Ad Hoc Pelagics Coalition ("AHPC" or "Coalition"). The AHPC is comprised of the Gloucester, Massachusetts-based herring fishing and processing companies Western Seafishing Co., Cape Seafoods, Inc., and Irish Venture, Inc. We appreciate this opportunity to comment on these proposed changes to the herring ISFMP.

The Coalition notes the Atlantic herring stock has been conservatively managed and, as a result, is extremely healthy. As the Amendment 3 Public Hearing Document notes, the fishery is neither overfished nor undergoing overfishing. In fact, retrospective pattern-adjusted spawning stock biomass for 2014 – 623,000 metric tons ("mt") – is four times above the overfished level (155,573 mt). As Figure 4 from Amendment 3 (reproduced below) shows, this stock has not been overfished since 1985. The stock is also being fished at sustainable rates. The current fishing mortality rate ("F"), F=0.16, is a one-third below the target F of 0.24.

Indeed, the major issue with the Atlantic herring fishery over the past decade or so has been the inability to achieve optimum yield ("OY") in most years. Achieving OY is one of the major goals of the ISFMP generally and Amendment 3 in particular. Such underfishing has been caused by a combination of measures that have restricted the major gear-type, mid-water trawls, and constraints imposed to foster other conservation objectives, such as bycatch caps. In the 2015 fishing year, for instance, nearly 10,000 mt of total allowable catch ("TAC") Area 3 was not caught due to projections that the incidental haddock catch cap had been reached.

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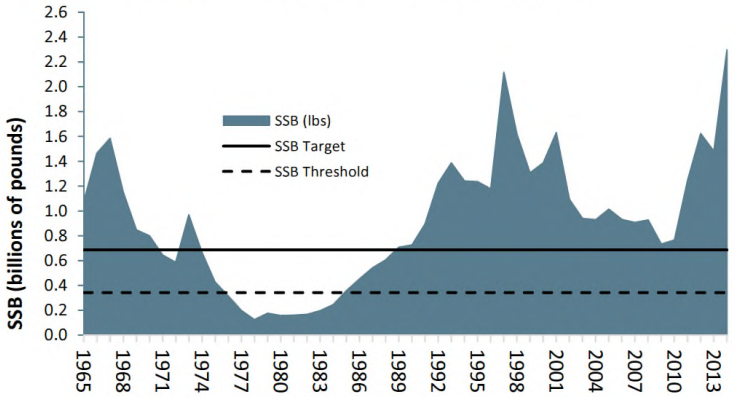
Figure 4. Atlantic Herring Spawning Stock Biomass (SSB) (Deroba, 2015)



This background provides important context to AHPC's comments. In particular, and as explained in greater detail below, the Coalition strongly opposes an extension of the spawning closures to six weeks. This measure would unfairly penalize AHPC's vessels by excluding them entirely from the New Hamshire/Massachusetts spawning area for the limited time they have to fish in these near-port waters, and would likely result in a *de facto* exlcusion from Area 1A entirely. Nor is such a measure justified in terms of conservation, as the stock's status clearly demonstrates.

Below, AHPC provides specific comments on each of the options presented in the Amendment 3:

1. Spawning Area Closure Monitoring System (4.1.1)

AHPC supports the status quo. The current system has worked reasonably well, although the fishery has generally closed on the default date. The fact that the trigger generally has not been met, coupled with frequent reclosures, indicate that the default dates have been set too early. Thus, AHPC believes that the current triggers should continue to be used and the default date moved until later in the fishing year (see number 2 below).

Options 2 and 3 likely also to lead to closures before the primary spawning begins. Each utilize samples of herring taken from the bottom, which will over-sample early spawners. Further, Option 3 relies on too few samples, some (or many) of which will be biased. If Option 3 is chosen, however, then the third option, 90th percentile, should be selected as the GSI_{30} trigger value. This sub-option would help alleviate some of the impacts of an early closure.

2. Default Closure Dates (4.1.2)

As mentioned above, for the most part, the fishery has closed not due to evidence of spawning herring, but rather by default. Moreover, all too often, the fishery recloses after the initial four-week period. This strongly suggests that spawning activity begins later than previously assumed. For this reason, coupled with the fact that evidence suggests spawning periods begin at about the same time in the Western Maine and New Hampshire/Massachusetts areas, AHPC belives that the Board should use the October 17 default closure date (Option C, Sub-Option 3) for these three areas in combination with the current monitoring system.

Although this measure is associated with the GSI_{30} trigger option, its use with the current methodology is reasonable as a matter of policy. Further, as the primary issue is when the fishery should close by default, the public had a fair opportunity to comment on what is essentially a minor modification to the alternative. However, if the Board believes that the this sub-option can only be used in conjunction with the GSI_{30} trigger, AHPC supports Option 1, status quo.

3. Spawning Area Boundaries (4.1.3)

Access to the Western Maine spawning area is critical to the Gloucester-based fishing vessels when the New Hampshire/Massachusetts area is closed. Thus, unless Board adopts AHPC's recommendation for establishing a common default closure date of October 17 for both areas, it should maintain these as distinct areas.

4. Spawning Closure Period (4.1.4)

APHC strongly supports the status quo, four-week initial closure. The Gloucester fleet has had its access to the herring resource in Area 1A, and elsewhere, severely curtailed. A six-week closure would almost certainly eliminate this fleet from the Area 1A fishery entirely while serving no conservation purpose. Further, in light of the strong state of the herring resource and the immense disruption to the fishery that re-closures cause, AHPC supports Option 3, no re-closure.

5. Fixed Gear Set-Aside Provision Adjustment (4.2)

As Amendment 3 notes, there is no biological implications associated with removing the November 1 rollover provision. As such, AHPC takes no position on this Option.

6. Empty Fish Hold Provision

This measure is proposed to help ensure that the Herring ISFMP remains consistent with federal herring fishery management plan. As such consistency is important to the industry, AHPC believes that the Herring Board should adopt an empty hold provision identical to that adopted by the National Marine Fisheries Service in Framework Adjustment 4 to the Atlantic Herring FMP when that framework is finalized.

# # # #

Thank you very much for this opportunity to comment. We would be pleased to answer any questions you may have.

Sincerely,

Shaun M. Gehan
Counsel to the Ad Hoc Pelagics Coaltion

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120 Tillson Ave
Rockland Maine 04841

Ashton Harp
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aharp@asmfc.org

RE: Draft Amendment 3

Dear Ms. Harp:
I am writing to provide comments on Draft Amendment 3 to the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fishery Management Plan (FMP) for Atlantic Herring on behalf of the F/V Starlight and F/V Sunlight. These vessels are owned and operated by Alfred Osgood, Vinalhaven, Maine and the O'Hara Corporation, Rockland, Maine. Our vessels participate in the herring fishery on a year round basis actively fishing all areas of the fishery. In addition, the O'Hara Corporation operates O'Hara Lobster Bait in Rockland supplying bait to the coast of Maine for more than 65 years.

This Amendment proposes changes to: 1. spawning protection measures, 2. fixed gear set-asides provisions, and 3. new empty fish hold options. Issue #1 proposes changes to the spawning monitoring program, including boundaries, default start dates, and length of the closure period; all of which are likely to have significant impacts to the fishery. Issues #2 and #3 are fairly straight forward and adequately described in the document.

We have struggled with the broad, sweeping changes proposed to spawning measures in this Amendment 3 Public Hearing document. We do not find the measures adequately described in the document or supported by sufficient analysis – some analysis appears to have been done, but simply not included in the document.

We are thankful that the Atlantic herring resource has sustained a healthy biomass over the past two decades, with spawning measures in place that have provided enhanced support for recruitment to the population. While we do appreciate efforts to make a valuable program better, **we do not find this document ready for final action by the Herring Section.** There is an opportunity here to be thorough and thoughtful in an approach that considers adequate spawning protection while allowing the fishery to operate. We have a stable resource that has sustained stable landings in the fishery for a long period– a success story. There is no crisis here - which allows for a go slow approach to this major change to the fishery.

Errors and Omissions in the Draft Public Hearing Document

Below are two areas of concern in the document that contain significant errors, references to data not included and basic analysis not investigated or provided. The significance of the errors do not provide any confidence that other sections, that have not been ground truthed here, do not also contain incorrect or misleading information. We recommend the entire document be reviewed for accuracy.

Section 1.2.2 Stock Assessment Summary

This entire Section of the document is incorrect and contains multiple errors. In part, this section appears to confuse the 2012 Benchmark Assessment with the 2015 Update. Personal communication with the Atlantic herring stock assessment author indicates that there are numerous, significant errors in the entirety of this section. One example he noted Section 1.2.2.2., SSB, states the 2014 update indicated "... a 40% decrease in SSB from the 2012 assessment," and he was unable to figure out how anyone came to this conclusion.

Error Example #2: Section, 1.2.2.1. Abundance and Present Condition:

"The 2015 operational (update) stock assessment, using the Age Structured Assessment Program (ASAP) framework, resolved the retrospective pattern in the 2012 stock assessment for Atlantic herring (54th SAW)"

A correct statement would be: The 2012 stock assessment resolved a persistent retrospective pattern; this pattern reappeared in the 2015 operational update and values were rho adjusted.

Spawning Efficacy Sections

In personal conversations with members of the industry and the Advisory Panel there is strong support for spawning protection, but much confusion over the new methodology presented here and fear of unknown impacts to both the directed fishery and dependent bait users in the lobster fishery. Major changes in the timing of closures can have significant impacts in the market if these fish cannot be replaced by fish caught in another area. The later the closure date the higher the chance of these disruptions. There is a lack of basic data in the document to inform these decisions.

- There is no information on the historical landing stream by month or week during the period to indicate fishery dependence or market demand during the proposed closure periods.
- There is no mention of the exclusion of midwater trawls in Area 1A until October 1 and how the measures could have differential impacts to the gears that operate in the fishery.
- There is no information on the dependency of the lobster fishery on herring for use as bait during the proposed closure periods.

- There is a need for greater clarity around a choice of a GSI Trigger. Each trigger option proposes a different level of protection which could not possibly require the same closure length to achieve, but the document does not speak to this.
- There is no information provided that compares Status Quo on an annual basis (using historical data) with the proposed projection methodology. The Appendix speaks to the analysis of these closure dates over time on p.51 (para. 1, sent. 1 & 2) and references Figures 7 and 8; however the actual Figures are not included anywhere in the document. We request Figures 7 and 8 be added to the appendix of this PH document. How often would MA/NH close on Sept 24, Oct 1 or Oct 17? The document provides no guidance on this and makes it impossible to make an informed recommendation.

Some of the data we request is readily available in the most recent 2016-2018 specifications document prepared by the New England Fishery Management Council. Some analysis appears to have been done but simply not included in the document or appendix.

Common Concerns

In our conversations with industry and bait customers we hear some common concerns. In general there is a lack of trust in the data used to support increasing spawning closures from 4 to 6 weeks, especially the inclusion of egg bed information. There is a sense that combining the western GOM with the NH/MA closure is another administrative convenience that does not benefit the fish or the fishery. People are concerned that going from a 100 fish sample size to 25 females is too small a sample size and a downgrade to data quality. Also, it is not at all clear that moving to a forecast method provides any greater notice of closures to the fishery than the current system that fishermen track very closely.

<u>Section Action</u>

We recommend the Section correct and update the Public Hearing Document prior to final action on this Amendment. Should the Section choose to take action at their February 2, 2016 meeting, we recommend the following.

Issue #1 Spawning Area Efficacy

We recommend the Section develop a pilot program that would parallel the new monitoring program and other proposed elements with the Status Quo and review these results in 2017. The Status Quo measures would remain in the interim.

Issue #2 Fixed Gear Set-Aside

Draft Amendment 3 includes options to remove the fixed gear set-aside rollover provision. The current federal and state FMPs allow for up to a 500 mt set aside for fixed gear through the specification process that rolls over to the directed fishery if not utilized by November 1. While this is a small percentage of Area 1A ACL, this proposed measure will not change the management of the set-aside without a change to the federal FMP. Regardless of Commission action on these measures, NMFS will continue to manage the set-aside at status quo; and thus

will have no effect in the management of the fishery. *We recommend the Section take no action until there is complementary measures considered in the federal plan.*

Issue #3 Empty Fish Hold

Lastly, Draft Amendment 3 considers a requirement for fish holds to be empty of fish prior to trip departures. If effective at incentivizing market-appropriate fishing behaviors, the amount of herring caught in surplus of market demand should be reduced.

The empty fish hold provision applies to vessels departing on a fishing trip (i.e., declared into the fishery), but not for vessels transporting fish from port-to-port (i.e., not declared into the fishery). Waivers could be granted for instances where it is impossible to sell the fish (e.g., refrigeration failure or non-marketable fish). Waivers would not be required for vessels transporting fish from dock-to-dock. At this time, industry supports no limit on waivers issued for legitimate reasons to match the Council's approved option

We recommend the Section adopt Option C2: State Empty Fish Hold Provision for Select Vessels. This option is the same as C1, but it is NOT contingent on federal adoption. Meaning if NMFS does not adopt Framework Adjustment 4 then the states can still implement this option. If Option C2 is not preferred we recommend B2 State Empty Fish Hold Provision.

In Conclusion

Thank you for this opportunity to consider improvements to the Atlantic Herring spawning measures and other management options presented in Amendment 3. Unfortunately, the information presented in the Public Hearing document is not sufficient in determining impacts to our vessels or lobster customers in our coastal Maine communities. We look forward to continuing to work with the Section in the ongoing management of the Atlantic herring.

Sincerely,
Mary Beth Tooley
Government Affairs
O'Hara Corporation
mbtooley@oharacorporation.com

ASMFC Atlantic Herring Advisory Panel
Conference Call - October 23, 2015 – 10:00 AM
Issues and Options Draft Amendment 3 to the Atlantic Herring IFMP

Note: The Atlantic Herring Advisory Panel (AP) selected Draft Amendment 3 options in October. The AP was given the chance to provide additional comment during the public comment period in December/January. The AP has no further comment on the document.

Meeting Staff: Ashton Harp (ASMFC)

Advisory Panel (9): Jeff Kaelin (Chair - NJ), Greg DiDomenico (NJ), Philip Ruhle Jr. (RI), Shawn Joyce (NH), Stephen Weiner (MA), Patrick Paquette (MA), Jennie Bichrest (ME), Mary Beth Tooley (ME), Peter Moore (ME)

Public (2): Terry Stockwell (Section Chair - ME), Brad Schondelmeier (MADMF)

The Atlantic States Marine Fisheries Commission's Atlantic Herring Advisory Panel met via conference call on October 23, 2015 to discuss the issues and options in Draft Amendment 3. These reflect the guidance given to the Plan Development Team (PDT) at the August Section meeting—to, primarily, develop options that protect spawning fish in the Gulf of Maine. The Section will consider options for public comment when it meets on November 2, 2015.

Prior to considering the discussion document, an advisor voiced concern that the document provides no biological analysis or socio-economic analysis, so that weighing some of the spawning closure options becomes difficult. The January 2015 TC report was mentioned as helpful, relative to better understanding the forecasting system being recommended, but the AP, generally, had remaining questions about how the system would work.

It was also noted that the problem statement should include a discussion of the current status of Atlantic herring's spawning stock status and that Table 3 and Figure 2 of the Council's 2016-2018 Herring Specifications document could be included to provide this information. Some advisors suggested that any additional spawning protection in the Gulf of Maine should be tied to spawning stock status, coastwide, since extending the GOM closure period for an additional two weeks would have significant economic impacts on herring fisherman and the lobster fishery, where bait demand is high during the late summer and fall period.

Issue 1: Spawning Area Efficacy (Section 2.0)

2.1 *Spawning Area Closure Monitoring System*

There was consensus in support of *Option C, GSI_{30}-Based Forecast System*. Advisors supported the forecast system's likely ability to better target closures to periods of time when the majority of fish are spawning. Advance warning prior to a closure was voiced as a positive, which is provided by the forecasting system's announcing closures 5 days before the forecasted date. Advisors voiced concern about the fact that last week's opening and reclosing of the MA/NH spawning area all took place within 24 hours, which caused significant disruption to the fishery. Some advisors suggested that much of the fish in that area had already spawned and that the weather was better than it had been for a month. Advisors commented that the goal of this program should not be to save every spawning herring,

particularly given the coastal spawning stock condition today. Advisor's also supported this option as it requires that projections would be based on a minimum of 3 samples. One advisor supported the status quo, Option A.

REQUEST: The AP asked the TC why is the forecasting system standardized for larger fish (30 cm) when the current GSI (gonadosomatic index) is based on fish under 28 inches?

There was no consensus relative to which of the three *GSI_{30} Trigger Value* options should be chosen.

2.2 *Default Closure Dates*

As noted above, the AP could not come to a consensus on the appropriate GSI_{30} trigger value due to uncertainty of the outcome. Five people felt the 70^{th} percentile trigger value would provide additional protection so fishing just prior to spawning would not happen. One person was opposed to the 70^{th} percentile option, they felt the fishery would have to stay closed longer to accommodate maturing fish and spawners.

REQUEST: The AP asked, how do each of the percentile triggers compare or relate to the status quo approach?

2.3 *Spawning Area Boundaries*

There was a general consensus in support of *Option A, status quo,* which has the effect of maintaining the three spawning areas. The AP voiced concern and reluctance to combine the Western Maine and Massachusetts/New Hampshire spawning areas. Advisors felt Option B would likely result in a large coastal shutdown based on a few samples. In addition, the AP felt there was not sufficient biological evidence to support anything other than status quo.

REQUEST: The AP suggested that a chart depicting the spawning area boundaries would be helpful for the public and that the document should also reflect fishing effort in these areas over time; the NMFS should be able to supply VMS (vessel monitoring system) data

2.4 *Spawning Closure Period*

Closure Period

There were seven advisors in support of the status quo, Option A, a four week closure with the fishery being closed for an additional two weeks, if necessary, and three in favor of Option B, a six week closure. A participant commented they were not entirely in favor of a six week closure, but it was better than the status quo given the potential damage (i.e. fishing on spawners) that one herring boat can impose in just a couple of days. A participant in favor of status quo commented that there is not enough social and economic data to justify a six week closure and the document should outline the effects it could potentially have on lobster fishermen.

Re-closure Protocol

Three advisors were in favor of the status quo and two participants were in favor of option B, defined protocol. Those in favor of Option B liked that it only involved one sample to initiate a re-closure, which is why other advisors opposed it.

Issue 2: Fixed Gear Set-Aside Provision Adjustment (Section 3.0)

The AP was unanimously in favor of the *status quo, Option A.*

REQUEST: The AP asked that the document include historical landings in the fixed gear fishery. This information should also be available in the Council's specifications document.

Issue 3: Empty Fish Hold Provision (Section 4.0)

There was general support for an empty fish hold provision in the fishery and the issue has been addressed by the Council. Five advisors were in favor of Option E, an empty fish hold provision, limiting the requirements to vessels with the ability to pump fish, that is not contingent on federal adoption and two participants were in favor of Option B, an empty fish hold provision, with the pumping limitation, that is contingent upon federal adoption of the same provision.

Other Comments:

- The AP discussed the benefit of reinstating a tolerance for spawning fish in the fishery because it would provide the opportunity to regularly collect samples of herring for GSI analysis from vessels that are working in the area to be closed. REQUEST: The majority of AP members requested that the Section consider adding a tolerance option to draft Amendment 3. One advisor did not support this suggestion.
- Add information relative to current status of the fishery (i.e., SSB) in the introduction of the document.
- A participant said they were confused about the goals and objectives of the draft amendment, there should text added to the document that describes that protecting spawning fish is a goal, in addition to maintaining the fishery and markets. Protecting spawning fish exclusively is unrealistic.
- One participant noted that although the spawning stock biomass is above the target, there is still a need to update the spawning closure system. The spawning closure system is necessary irrespective of the status of the stock.

ACTION: The Chair suggested that the AP be polled to see who would like to continue being an AP member and re-populate the AP if necessary. Nine of sixteen members participated in the conference call.

The AP call ended at 12:00 PM