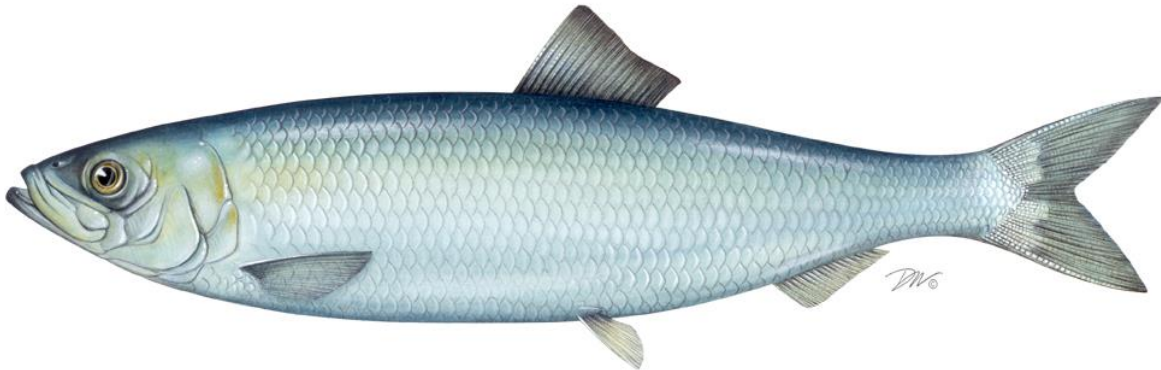


**ATLANTIC STATES MARINE FISHERIES COMMISSION**

**REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN**

**FOR ATLANTIC HERRING**  
*(Clupea harengus)*

**2019 FISHING YEAR**



Prepared by the Atlantic Herring Plan Review Team

Approved June 1, 2020  
Updated June 2021 (Section III)



*Sustainable and Cooperative Management of Atlantic Coastal Fisheries*

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## I. Status of Fishery Management Plan

<u>Date of FMP Approval</u>	November 1993
<u>Amendments</u>	Amendment 1 (February 1999) Amendment 2 (March 2006) Amendment 3 (February 2016)
<u>Addenda</u>	Addendum I to Amendment 1 (July 2000) Technical Addendum #1A to Amendment I (October 2001) Addendum II to Amendment I (February 2002) Technical Addendum 1 to Amendment 2 (August 2006) Addendum I to Amendment 2 (March 2009) Addendum II to Amendment 2 (December 2010) Addendum V to Amendment 2 (October 2012) Addendum VI to Amendment 2 (August 2013) Addendum I to Amendment 3 (May 2017) Addendum II to Amendment 3 (May 2019)
<u>Management Unit</u>	US waters of the northwest Atlantic Ocean from the shoreline to the seaward boundary of the Exclusive Economic Zone (East Coast of Maine), and from the US/Canadian border to the southern end of the species range (Cape Hatteras, North Carolina).
<u>States With Declared Interest</u>	Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, and New Jersey
<u>Active Boards/Committees</u>	Atlantic Herring Management Board (Since August 2018; previously Section), Advisory Panel, Technical Committee, Stock Assessment Subcommittee, and Plan Review Team

Atlantic herring (*Clupea harengus*), also known as sea herring, are an oceanic fish that occur in large schools and undergo seasonal inshore-offshore migrations. Herring are important to the Northwest Atlantic ecosystem as a forage species and to the fishing industry as bait for lobster, blue crab, and tuna. To a lesser degree this resource also serves as a food, typically canned, pickled, or smoked. The U.S. Atlantic herring fishery is currently managed as a single stock through complementary plans by the Atlantic States Marine Fisheries Commission (ASMFC) and the New England Fishery Management Council (NEFMC).

The stockwide annual catch limit (ACL) is divided amongst four distinct management areas: inshore Gulf of Maine (Area 1A), offshore Gulf of Maine (Area 1B), Southern New England/Mid-Atlantic (Area 2), and Georges Bank (Area 3). The Area 1A fishery is managed by ASMFC's Atlantic Herring Management Board (Board), which includes representatives from Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York and New Jersey.

[Amendment 1 \(February 1999\)](#) was developed in order to maintain consistency between the ASMFC and NEFMC FMPs. This amendment establishes the same overfishing definition and biological reference points as the NEFMC, which were created under guidelines stipulated in the revised Magnuson-Stevens Fishery Conservation and Management Act prior to the 2006 re-authorization. The overfishing and biological reference points are based on an estimate of maximum sustainable yield (MSY) for the entire stock complex.

Amendment 1 also establishes “days out” control measures which prohibit directed fishing on Friday and Saturday when 50% of the TAC is projected to be harvested, Friday through Sunday when 75% of the TAC is projected to be harvested, and Thursday through Sunday when 90% of the TAC is projected to be harvested.

#### [Addendum I \(July 2000\)](#)

The Section developed Addendum I (to Amendment 1) to re-address the protection of spawning areas because NOAA Fisheries rejected the spawning closures in federal waters for Management Area 1A (inshore Gulf of Maine). Specifically, Addendum I redefines the state waters spawning areas outlined in Amendment 1. This addendum also changed the due date for annual state compliance reports to February 1<sup>st</sup>.

#### [Technical Addendum 1a \(October 2001\)](#)

The Section approved Technical Addendum #1a (to Amendment 1) to change the delineation of the Eastern Maine spawning boundary because the spawning aggregations were not adequately protected in 2000.

#### [Addendum II \(February 2002\)](#)

Addendum II (to Amendment 1) was developed in conjunction with the NEFMC’s Framework Adjustment I to allocate the Management Area 1A Total Allowable Catch (TAC) on a seasonal basis. Addendum II also specifies the procedures for allocating the annual Internal Waters Processing (IWP) quota.

#### [Amendment 2 \(March 2006\)](#)

Amendment 2 was developed in close coordination with the NEFMC as they developed Amendment 1 to the Federal Fishery Management Plan for Atlantic Herring. The NEFMC’s Amendment 1 is complementary to ASMFC Amendment 2 in that both documents’ goal is optimum yield through coordinated management between state and federal waters. Amendment 2 altered the management boundaries, set biological reference points, expanded on the TAC specification setting process, established research set-asides, altered days out measures, removed any allowance for fishing during spawning closures, and granted exemptions for east of Cutler fixed gear fishermen.

Changes to the management boundaries were based on recommendations from the 2003 TRAC to better reflect spawning distributions and minimize reporting errors. The new boundaries result in a larger boundary for Area 3.

The biological reference points, based on  $MSY = 220,000$  mt, give a measurable criteria for overfishing and overfished and allow management to determine if rebuilding efforts are necessary. The TAC process only changed slightly with Amendment 2. Amendment 2 allows analytical approaches other than those defined in Amendment 1 to establish area-specific TACs. These changes allow the TC to use the best available science when recommending TACs rather than binding them to methods that were the best when Amendment 1 was created. Another change to the TAC process under Amendment 2 is that the Section will set the TACs for three years with the flexibility to adjust in interim years.

Research set asides were established under Amendment 2 allowing up to 3% of an area to be designated for and allocated to research.

In addition to establishing a number of new management measures, Amendment 2 altered several measures enacted in Amendment 1. Default percentages for setting days out were removed to allow states adjacent to an area to meet and agree on which days to take out as best meets the needs of the fishery for that given year. The 20% spawning tolerance for directed fishing during spawning closures was removed and a “Zero-Tolerance” measure was enacted. Amendment 2 also granted exemptions for east of Cutler fixed gear fishermen from days out and spawning closure restrictions established in Amendment 1. These exemptions were granted because the east of Cutler landings are part of a New Brunswick stock and have been insignificantly small historically. These herring do not often migrate inshore until after the Area 1A TAC is harvested making exemptions the only way to protect this historical fishery. These landings are counted against the overall Area 1A TAC.

#### [Technical Addendum I \(August 2006\)](#)

Technical Addendum I was developed to clarify the intent of the “Zero Tolerance” spawning provision of Amendment 2. Some states were interpreting the zero tolerance to mean that you could still fish in an area closed to spawning as long as no spawn herring were present in the area. This addendum makes it clear that *any vessel is prohibited to fish for, take, land, or possess herring from or within a restricted spawning area.*

#### [Addendum I \(February 2009\)](#)

Addendum I (to Amendment 2) was developed to control effort in Area 1A using a combination of quotas, additional days out restrictions, and weekly state reporting requirements to effectively manage quota. Specifically, Addendum I allows states adjacent to Area 1A to select bimonthly, trimester, or seasonal quotas as best meets the needs of the fishery. States also have the flexibility to save quota from January – May and distribute it to later in the year when price and demand are often higher. Fishermen are restricted to one landing per day and state-only fishermen must report weekly in order to effectively manage quota.

#### [Addendum II \(December 2010\)](#)

Addendum II was designed to mirror the NEFMC Amendment 4 and changes the specifications’ definitions (and associated acronyms), modifies the process to set specifications, and establishes accountability measure (AM) paybacks. Under Addendum II, the overall quota is

now called an annual catch limit (ACL) and the quota allocated to each management area (Area 1A, 1B, 2, 3) is called a sub-ACL (previously TAC). In addition, if harvest in any area is exceeded, the sub-ACL will be reduced by an amount equal to the overage the first year after final landings are available.

NEFMC's Amendment 4 includes provisions to bring the Herring FMP into compliance with provisions of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006. It changes the specification setting process and definitions to include an overfishing limit, acceptable biological catch, annual catch limits, and accountability measures, as well as involvement of a Science and Statistical Committee.

#### [Addendum V \(August 2012\)](#)

Addendum V refines and clarifies current spawning regulations without making significant changes. Specifically, Addendum V establishes when closures are triggered based on the percent of stage III – V spawn herring that are greater than or equal to 23 cm and increased the number of samples states are required to collect from 50 to 100 (states are currently sampling at this level). The Addendum replaces all spawning regulations in previous management documents to provide a single, clear document for states to use when complying with ASMFC spawning regulations.

#### [Addendum VI \(August 2013\)](#)

The Addendum improves alignment between state and federal Atlantic herring management by allowing the use of consistent tools across all four management areas of the species range. The Addendum's measures include (1) seasonal splitting of the annual catch limit sub-components (sub-ACLs) for Areas 1B, 2, and 3; (2) up to 10% carryover of a sub-ACL for all management areas; (3) the establishment of triggers to initiate the closing of directed fisheries; and (4) the use of the annual specification process to set triggers.

#### [Amendment 3 \(February 2016\)](#)

Amendment 3 refines the spawning closure system, modifies the fixed gear set-aside, and includes an empty fish hold provision contingent on federal adoption. The Amendment allows for the use of a modified GSI-based spawning monitoring system to track reproductive maturity in an effort to better align the timing of spawning area closures with the onset of spawning, which was tested and evaluated for effectiveness during the 2016 fishing season. Additionally, the fixed gear set-aside that was previously available to fixed gear fishermen exclusively only through November 1, is now accessible to them as long as the directed fishery is open. Amendment 3 consolidates prior amendments (and associated addenda) and recent management decisions into a single document; it is now the comprehensive document for Atlantic herring management in state waters.

#### [Addendum I \(May 2017\)](#)

Addendum I includes management measures intended to stabilize the rate of catch in the Area 1A fishery and distribute the seasonal quota throughout Trimester 2 (June through September), which has 72.8% of the season's allocation. For the 2017 fishing season, the addendum

established that the Section would separately address days out provisions for federal herring Category A vessels and small-mesh bottom trawl vessels with a federal herring Category C or D permit. In addition to landing restrictions associated with the days out program, Category A vessels are now prohibited from possessing herring caught from Area 1A during a day out of the fishery. Small-mesh bottom trawl vessels with a Category C or D permit must notify states of their intent to fish in Area 1A prior to June 1<sup>st</sup>. The addendum also implements a weekly harvester landing limit for vessels with a Category A permit for the 2017 fishing season. Forty-five days prior to the start of the fishing season, Category A vessels will notify states of their intent to fish in Area 1A, including a specification of gear type, to provide states with an estimate of effort to calculate the weekly landing limit. States may also either implement measures that herring caught in Area 1A can only be landed by the respective harvester vessel (i.e. no carrier vessels) or that herring carrier vessels are limited to receiving at-sea transfers from one harvester vessel per week and landing once per 24-hour period. Through the addendum, NOAA Fisheries granted access to vessel monitoring system-submitted daily catch report data for select staff in Maine, New Hampshire and Massachusetts to provide real-time data for the states to implement a weekly landing limit. The Section also approved continuing the use of the GSI30-based forecast system to determine spawning closures in Area 1A.

#### [Addendum II \(May 2019\)](#)

Addendum II strengthens spawning protections in Area 1A (inshore Gulf of Maine) by initiating a closure when a lower percentage of the population is spawning (from approximately 25% to 20%), and extending the closure for a longer time (from four to six weeks). The Addendum also modifies the trigger level necessary to reclose the fishery, with the fishery reclosing when 20% or more of the sampled herring are mature but have not yet spawned. These changes to spawning protections are in response to the results of the 2018 Benchmark Stock Assessment which showed reduced levels of recruitment and spawning stock biomass over the past five years, with 2016 recruitment levels the lowest on record.

### **II. Status of the Stock**

The most recent benchmark stock assessment for Atlantic herring was peer reviewed in August 2018 (SAW-65). The assessment found that Atlantic Herring are not overfished and overfishing is not occurring, but highlighted concerns about trends in recruitment and spawning stock biomass. Recruitment has been below the time series average for the last five years. In particular, 2016 recruitment was the lowest on record at 1.7 million fish. While recruitment has been variable throughout time, recent and continuing low levels of recruitment indicate that there will be fewer fish available to harvest in future years. Spawning stock biomass (SSB) has also been lower in recent years. In 2017, SSB was estimated at 141,473 mt, below the SSB threshold of 189,000 mt (417 million pounds). Fishing mortality has decreased in recent years, with a 2017 level of 0.45, below the fishing mortality threshold of 0.51.

### **III. Status of the Fishery**

There is an Atlantic herring fishery in the United States and Canada. The U.S. Atlantic herring fishery is controlled by annual catch limits (ACL) set by NOAA Fisheries. The stockwide ACL is

distributed among the four management areas. Specifications are set every three years and adjusted annually to account for overages or underages from the previous fishing season. Once 92% of the sub-ACL for an area is reached, the respective fishery is closed. The stockwide fishery closes when 95% of the total ACL is projected to be reached. Following a closure, there is a 2,000 lb trip limit to allow for incidental bycatch of Atlantic herring for the remainder of the fishing year. In addition to quota-based closures, the “days out” and spawning closure programs provide additional measures to control fishing effort.

For the 2019 fishing season, the NEFMC and ASMFC set the ACL at 33.2 million pounds (15,065 metric tons). The ACL was subdivided by the Atlantic herring management areas as follows: Area 1A= 9.6 million pounds, Area 1B = 1.43 million pounds, Area 2 = 9.2 million pounds, and Area 3 = 12.96 million pounds. After adjusting for the research set-aside, the 39 mt fixed gear set-aside, and the 8% buffer (Area 1A closes at 92% of the sub-ACL), the Area 1A sub-annual catch limit (sub-ACL) was 8.49 million pounds (3,850 mt). For 2019, the Area 1A sub-ACL was further distributed among four bi-monthly quota periods as follows: Period 1 – June (16.1%); Period 2 – July-August (40.1%); Period 3 – September-October (34.0%); and Period 4 – November-December (9.5%).

The domestic Atlantic herring fishery is predominantly commercial; recreational catch accounts for less than 1% of landings. Over the time series of 1950 to 2019, annual landings by the United States Atlantic herring fleet generally increased and averaged roughly 129.9 million pounds (59,612 mt). Landings peaked in 2006 at 268.53 million pounds (121,804 mt) and reached the lowest level in 2019, at just over 29 million pounds (over 13,154 mt).

Catch, in metric tons, from Area 1A is shown in Table 1. Preliminary information from 2019 indicates that 4,689 mt were caught in Area 1A, representing 90.5% of the sub-ACL. Since the directed fishery closes when 92% of an area’s sub-ACL is projected to be reached, the fishery closed on November 27, 2019.

**Table 1:** Area 1A catch, sub-ACL, and associated directed fishery closures from 2013-2019. Source of catch information: NOAA Fisheries Atlantic Herring Fishery Monitoring

Year	Sub-ACL (mt)	Catch (mt)	% Utilized	Sub-ACL Closure
2013	29,775	29,820	100%	Oct-15
2014	33,031	33,428	101%	Oct-26
2015	30,290	29,406	97%	Nov-2
2016	30,102	27,826	92%	Oct-18
2017	31,115	28,682	92%	NA
2018	27,743*	24,814	89.4%	NA
2019	5,184	4,689**	90.5%	Nov-27

\*Adjusted August 22, 2018 from 31,962 mt to 27,743 mt

\*\*Preliminary landings data



## 2019 Fishing Season

Based on preliminary data provided in state compliance reports, Maine and Massachusetts accounted for over 81% of the commercial Atlantic herring landings in 2019 (Table 2). Landings decreased significantly for all states, with the exception of New Jersey which saw a slight increase.

**Table 2.** 2019 commercial landings by state and percent of total harvest. 2019 Landings data is considered preliminary at this time. Source: State compliance reports.

	<b>Commercial Landings (lbs)</b>	<b>Percent of Total</b>
ME	14,184,525	>48%
NH	Confidential	<1%
MA	9,728,088	>33%
RI	1,230,940	<5%
CT	28,899	<1%
NY	21,007	<1%
NJ	Confidential	>13%

Table 3 outlines the ‘days out’ program and effort control measures which were implemented in Area 1A. Based on the reduced sub-ACL, the Board approved bi-monthly quota periods for 2019, with the states of Maine, New Hampshire and Massachusetts choosing to delay the start of the fishery until July 15. Specifications established 4 consecutive landing days a week for vessels with a Category A permit. As of August 18 harvest had reached 92% of the Period 2 allocation, and the fishery moved to zero landings days through August 31. The fishery resumed from September 1-15 with the same specifications, then moved to zero landing days through the end Period 3 (October 31). The fishery resumed on November 3<sup>rd</sup> due to the transfer of quota from the Management Uncertainty Buffer to the Area 1A sub-ACL based on the performance of the Canadian weir fishery. The fishery officially closed on November 27 as NOAA had projected that 92% of the Area 1A sub-ACL to have been harvested.

**Table 3:** 2019 ‘days out’ program for bi-monthly quota periods in Area 1A.

<b>Bi-monthly periods</b>	<b>Date Effective</b>	<b>Consecutive Landing Days for Category A Permit</b>	<b>Weekly Landings Limit for Category A Permit</b>	<b>Poundage that can be Transferred to a Carrier Vessel</b>
<b>2</b>	July 14*-Aug 17	4	160,000	0
	Aug 18-31	0	0	0
<b>3</b>	Sept 1-15	4	160,000	0
	Sept 16- Oct 31	0	0	0
<b>4</b>	Nov 3-27	1	NA**	NA**

\*Zero landings days were specified for Period 1 (June). Fishery did not begin until July 14 (Maine) and July 15 (New Hampshire and Massachusetts)

\*\*Weekly Landing Limits and Carrier Vessel limits can only be specified through Sept 30

## **Spawning Area Closures**

The Atlantic Herring Area 1A (inshore Gulf of Maine) fishery regulations include seasonal spawning closures for portions of state and federal waters in Eastern Maine, Western Maine and Massachusetts/New Hampshire. In 2017, the Commission's Atlantic Herring Section permanently implemented the GSI<sub>30</sub> Based Forecast System for spawning closures in Area 1A. This forecasting method relies upon at least three samples, each containing at least 25 female herring in gonadal stages III-V, to trigger a spawning closure. If sufficient samples are not available, the spawning closure occurs on the default dates outlined in Amendment 3. As noted in the Status of the Fishery Management Plan section, Addendum II to Amendment 3 further modified the trigger for initiating a closure as well as the length of closures.

In 2019, the Eastern Maine spawning area closed on the default date of August 31<sup>st</sup> through October 11<sup>th</sup>, given there were no samples from the area at the time. The Western Maine spawning area also closed due to lack of samples on the default date of September 23<sup>rd</sup> through November 3<sup>rd</sup>. A re-closure occurred on November 6<sup>th</sup> through November 19<sup>th</sup> based on the analysis of one herring sample that, once analyzed, indicated 20% mature herring had yet to spawn.

For the Massachusetts/New Hampshire spawning area, closure occurred on the default date of September 23<sup>rd</sup> through November 3<sup>rd</sup> because the four samples collected could not produce a forecast.

## **IV. Status of Research and Monitoring**

Under Amendment 3, states are not required to conduct fishery independent surveys for Atlantic herring. However, state survey programs designed to catch other species may encounter herring regularly, so some states do collect biological information on Atlantic herring. A summary of these surveys results follow.

**Maine and New Hampshire:** The states jointly operate an inshore bottom trawl survey in the spring and fall that is designed to catch groundfish, but regularly encounters Atlantic herring. In 2019, herring catch was lower than in previous years in the spring survey but higher than in previous years for the fall survey. In the spring survey, herring were caught in 111 out of the 120 tows, and a maximum number of 31,759 were caught in one tow. In the fall survey, Atlantic herring were caught in 65 of the 99 tows, and a maximum of 13,009 were caught in one tow.

**Maine** Department of Marine Resources also conducts commercial portside catch sampling. In 2019, 50 sampling events occurred, covering purse seine, mid-water trawl, and small-mesh bottom trawl trips. The number of sampling events was a decline from 2018 levels (71).

**New Hampshire** Fish and Game Department also conducts a juvenile finfish seine survey in the Great Bay, its tributaries, and other coastal harbors. In 2019, 467 Atlantic herring were observed during the months of June, July, August, and October.

In 2019, **Massachusetts** Division of Marine Fisheries (MA DMF) conducted portside sampling of the midwater trawl (MWT) fishery Massachusetts landings including both herring and mackerel trips, at 25.9% (14 of 54) by trip and 30.7% (1,678 of 5,469 mt) by weight, in 2019. Data from an additional four Northeast Fisheries Observer Program (NEFOP) trips and one Maine Department of Marine Resources portside sampled trip landed in MA were incorporated into the bycatch avoidance program. MA DMF continued to utilize its real-time reporting mechanism (laptops with custom-designed reporting software) to receive NEFOP data from captains while at-sea. This negates the need to sample these observed trips, and supplements the overall coverage levels. Thus, combined trip coverage of 35.2% was achieved in 2019.

Additionally MA DMF has operated the River Herring Bycatch Avoidance Program in recent years. The primary goal of the program is to characterize the landings of vessels and advise the fleets of river herring bycatch, in an effort to minimize bycatch independent of management actions. Participating harvesters have generated over \$210,000 through RSA compensation fishing since 2014, all from Herring Management Area 1A. A no-cost extension allowed portside sampling to continue in 2019 by utilizing funds generated during the 2016-2018 RSA. River herring bycatch avoidance work was conducted under the 2019-2021 herring RSA; however zero RSA quota was harvested in 2019 due to low RSA allocations and restrictive landing days.

**Rhode Island** Division of Fish & Wildlife conducts a Seasonal Trawl Survey to develop abundance indices for Atlantic herring. Atlantic herring are mostly observed in the late fall and spring in the RIDFW seasonal trawl survey. Monitoring for 2019 suggested a decrease in the relative biomass and abundance of Atlantic herring in Rhode Island waters, a continued trend from 2017-2018. An average of 0.41 kg/tow of Atlantic herring was observed in 2019, higher than the .24 kg/tow observed during 2018, but still below 2017-2018. Similarly, the Atlantic herring abundance index derived from the trawl data decreased from 70.13 fish/tow in 2018 to 5.39 fish/tow in 2019.

**Connecticut** Department of Energy and Environmental Protection monitors Atlantic herring through the Long Island Sound Trawl Survey (LISTS), which is conducted each spring and fall since 1984. The Long Island Sound Trawl Survey underwent significant changes to the collection procedure in 2018-2019; as such, the QA/QC portion of the 2019 Survey is still underway. Preliminary data indicate that spring index is 1.01 fish/tow or about 22% less than the last ten years and 44% lower than the time series average (1.79 fish/tow).

**New York** has *de minimis* status and does not conduct directed monitoring of Atlantic herring.

**New Jersey** Division of Fish and Wildlife monitors Atlantic herring through the New Jersey Ocean Trawl Survey, which collects samples during five surveys conducted throughout the year between Sandy Hook, NJ and Cape Henlopen, Delaware. In 2019, 77.6 pounds (454 individuals) of Atlantic Herring were caught in the ocean trawl surveys.

## V. Status of Assessment Advice

The following research recommendations were included in the 2018 benchmark stock assessment.

Research Recommendations from the 65<sup>th</sup> Northeast Region Stock Assessment for Atlantic Herring (2018). The bolded items are identified as higher priority.

- **Further research on the use of acoustic technology for inclusion in stock assessment, including information using industry based platforms. Specifically:**
  - Investigate methods for converting herring acoustic indices to biomass.
  - Investigate refinements in target strength conversion to abundance estimates in acoustic data
  - Evaluate statistical design implications in acoustic data from surveys and ships of opportunity.
  - Additional research to better understand species identification using acoustic signals
- Investigate use of length data, stock structure and movement within assessment models (e.g. SS3)
- **Evaluate data collected in study fleet program for informing assessment data. Development research ideas that can be addressed within the context of the study fleet.**
  - Explore fisheries selectivity in greater depth. Perhaps with study fleet and with historical perspective with industry.
  - Research on depth preferences of herring in the water column through time to inform selectivity and catchability.
- Continue work related to understanding sources of variation in stomach contents, especially as this relates to the (GAMM) models used to develop an index of herring abundance.
- General assessment recommendations:
- **Evaluate the ability of state-space models to reliably estimate observation and process error variances under a range of scenarios, as well as their ability to estimate quantities of management interest**
- Develop a list of standards for evaluating data for possible use in stock assessment. Also develop standards for evaluating model diagnostics and inclusion criteria of indices.
- Develop protocols for multi model inference to provide management advice from stock assessments based on NEFSC experience as well as other input (e.g. model averaging approaches).
- Develop simulations to evaluate diagnostics that are useful under different scenarios (e.g. use of likelihoods, retrospective patterns for diagnostics, etc.).

## **VI. Management Measures and Issues**

Amendment 3 to the Interstate Fishery Management Plan for Atlantic Herring lists the following state regulatory requirements:

1. Each jurisdiction shall prohibit the landing of herring when the management area sub-ACL has been attained.
2. Vessels are prohibited from landing more than 2,000 lbs. of Atlantic herring from Area 1A when the fishery is closed, during a 'day out' or during spawning closures.
3. Jurisdictions will close the directed fishery when 92% of a management area's sub-ACL is projected to be harvested.
4. Each jurisdiction must enact spawning area restrictions that are at least as restrictive as those in Section 4.2.6.
5. States adjacent to Area 1A will implement days out restrictions as identified in Section 4.2.4.1.
6. States are required to implement weekly reporting by all non-federally permitted fishermen on Atlantic herring (including mobile and fixed gear).
7. Any herring vessel transiting a management area that is under a herring spawning closure or a 'day out' must have all of its fishing gear stowed.
8. The harvest of herring for the primary purpose of reduction to meal or meal-like product is prohibited.
9. Internal Water Processing operations will be prohibited from processing herring caught in all state waters.

## **VII. PRT Recommendations**

### **State Compliance**

All states with a declared interest in the management of Atlantic herring have submitted compliance reports and have regulations in place that meet or exceed the requirements of the Interstate Fisheries Management Plan for Atlantic Herring as described in Amendment 3.

### **Request for *De Minimis* Status**

A state may be eligible for *de minimis* status if its combined average of the last three years of commercial landings (by weight) constitute less than one percent of the coastwide commercial landings for the same three-year period.

New York has previously requested and met the requirements for *de minimis* status. The state's 2017-2019 combined average commercial landings (40,897 pounds) is less than 1% of coastwide commercial landings during the same three year period.

### **Research and Monitoring Recommendations**

In addition to the research recommendations outlined in the 2018 stock assessment, the PDT has previously recommended the following research priorities. The PDT will convene in 2020 to review these research recommendations in light of those put forward from SAW/SARC 65.

### Fishery-Dependent Priorities

#### *High*

- Investigate bycatch and discards in the directed herring fishery through both at-sea and portside sampling.
- Continue commercial catch sampling of Atlantic herring fisheries according to ACCSP protocols

### Fishery-Independent Priorities

#### *High*

- Expand monitoring of spawning components.

#### *Low*

- Continue to utilize the inshore and offshore hydroacoustic and trawl surveys to provide a fishery-independent estimation of stock sizes. Collaborative work between NMFS, DFO, state agencies, and the herring industry on acoustic surveys for herring should continue to be encouraged.

### Modeling / Quantitative Priorities

#### *Moderate*

- Conduct simulation studies to evaluate ways in which various time series can be evaluated and folded into the assessment model.
- Develop new approaches to estimating recruitment (i.e., juvenile abundance) from fishery-independent data.
- Examine the possible effects of density dependence (e.g., reduced growth rates at high population size) on parameter estimates used in assessments.

#### *Low*

- 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.
- Investigate the M rate assumed for all ages, the use of CPUE tuning indices, and the use of NEFSC fall bottom trawl survey tuning indices in the analytical assessment of herring.

### Life History, Biological, and Habitat Priorities

#### *Moderate*

- Continue 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.

#### *Low*

- Research depth preferences of herring.

## Management, Law Enforcement, and Socioeconomic Priorities

### *High*

- Continue to organize annual US-Canadian workshops to coordinate stock assessment activities and optimize cooperation in management approaches between the two countries.

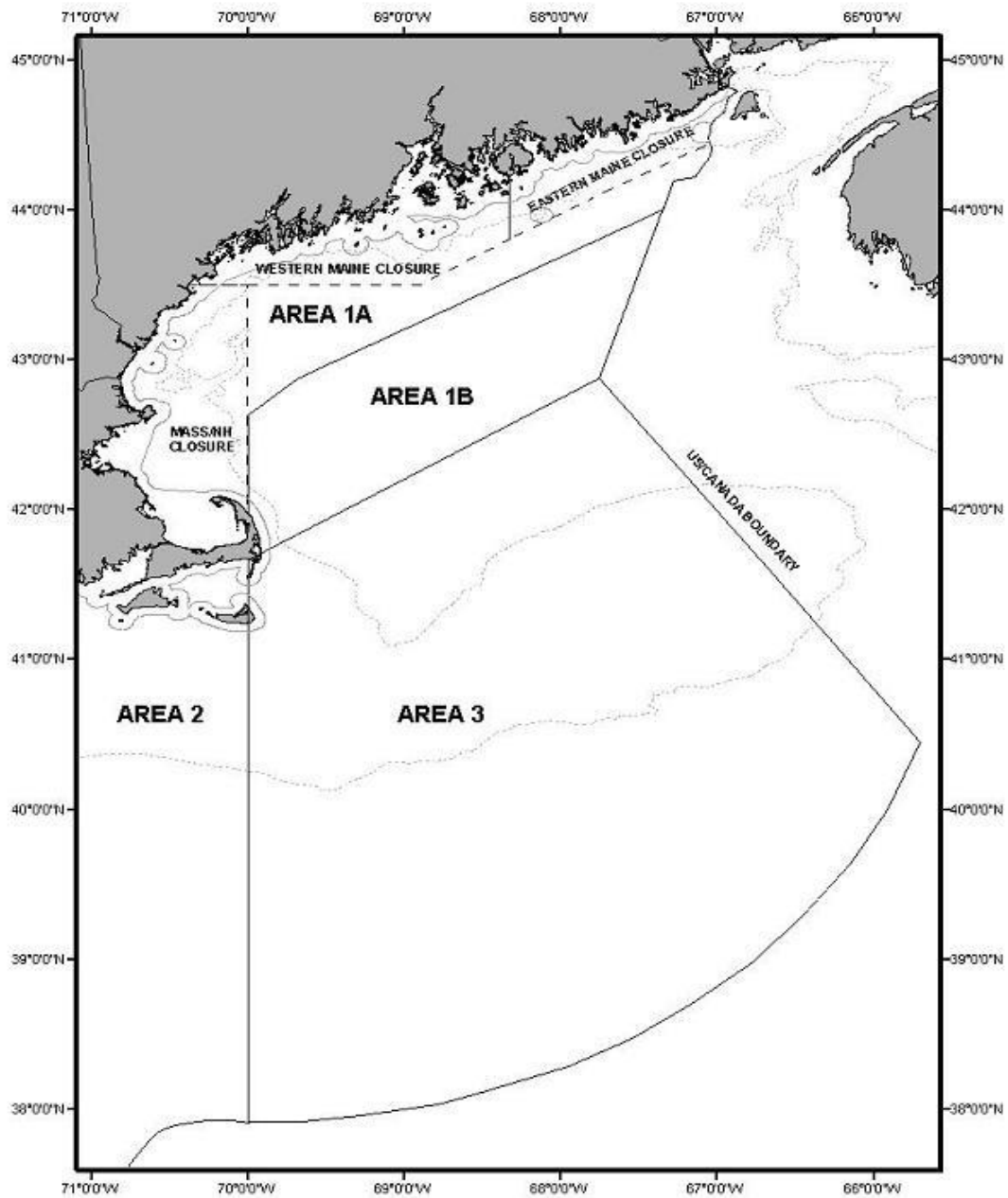
### *Moderate*

- Develop a strategy for assessing individual spawning components to better manage heavily exploited portion(s) of the stock complex, particularly the Gulf of Maine inshore spawning component.
- Develop socioeconomic analyses appropriate to the determination of optimum yield.

### *Low*

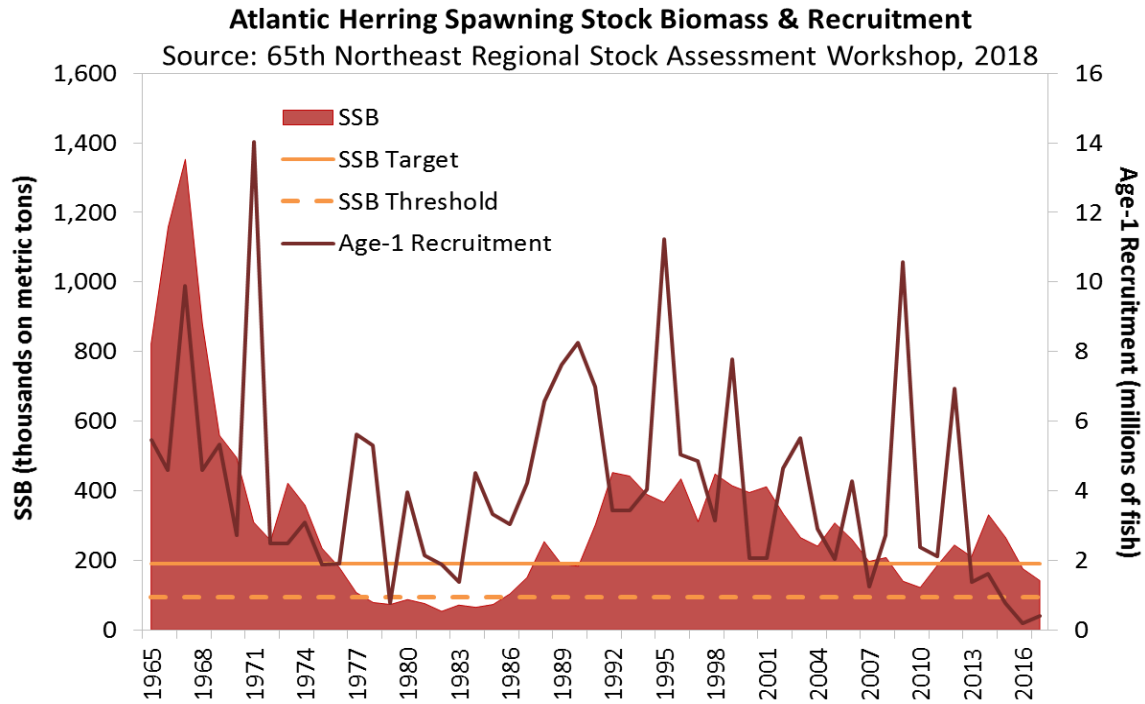
- Develop economic analyses necessary to evaluate the costs and benefits associated with different segments of the industry.

## XI. Figures

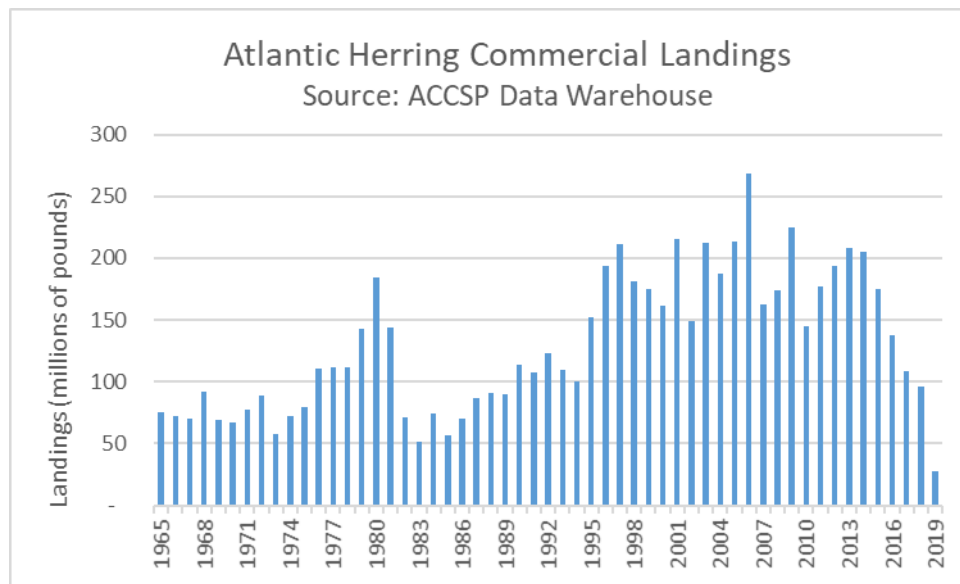


**Figure 1. Map of Atlantic herring management areas with boundaries and the three spawning areas are within Area 1A, the inshore region of Gulf of Maine.**





**Figure 2. Spawning stock biomass from 1965 to 2017.**



**Figure 3. Commercial Atlantic herring landings by the U.S. fleet from 1965-2019**