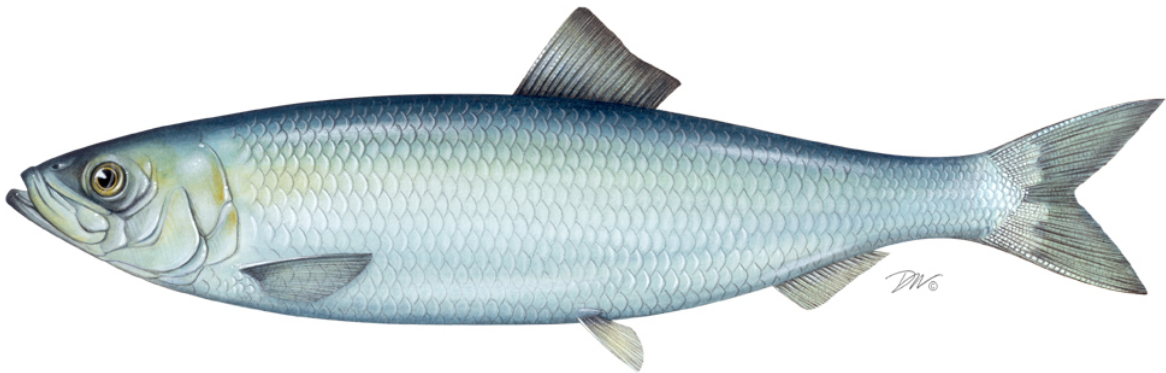


**2018 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR**

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

2017 FISHING YEAR



Atlantic Herring Plan Review Team

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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)
<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 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 Section (Section), which includes representatives from Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York and New Jersey.

The 1993 ASMFC Atlantic Herring Fishery Management Plan (FMP) was implemented to address the growth of the herring resource and interest in Internal Waters Processing (IWP) operations. Amendment 1 to the FMP was developed to complement the goals and objectives of the NEFMC federal management plan. It established total allowable catch limits (TACs) for specific management areas. The Days Out program was established for state waters.

Addendum I (2000) redefined spawning areas in state waters. It also reduced the exploitation of herring spawning aggregations by imposing a limited landing restriction on herring caught in spawning areas (20% tolerance for spawn herring in Maine and Massachusetts). Technical Addendum #1A (October 2001) was approved to change the delineation of the Eastern Maine spawning area.

Addendum II (2002) was developed in conjunction with NEFMC's Framework Adjustment 1 to allocate the Management Area 1A TAC on a seasonal basis. This addendum also specified procedures to allocate the annual Internal Waters Processing (IWP) quota.

Amendment 2 (2006) to the FMP was developed to complement management measures in Amendment 1 to the federal FMP. Identical management area boundaries were adopted, in addition to a joint TAC specification setting process between NEFMC and ASMFC, and management area closure when 95% of the TAC is harvested. Technical Addendum I to Amendment 2 (2006) was developed to address inconsistent interpretation of the zero tolerance spawning provision.

Addendum I (2009) identified tools to address effort in Area 1A in order to maintain a steady supply of herring throughout the fishing season. States adjacent to Area 1A could set bi-monthly, trimester or seasonal quotas and roll the quota into later periods if there was under-harvest. It also required states to implement weekly reporting for timely quota management.

Addendum II (2010) was developed to complement Amendment 4 to the federal FMP. It revised the specifications process (sets measures for three-years) and terminology (e.g., TAC is now called ACL) to be consistent with federal management.

Addendum V (2012) compiled the previously approved spawning regulations into one document and revised the spawning sample provisions.

Addendum VI (2013) was developed to complement the NEFMC's Framework Adjustment 2 to the federal FMP. It established new provisions and consistent measures for the four management areas. States were allowed to seasonally split sub-ACLs for each management area, and up to 10% of unused sub-ACL could be carried over to the following fishing year (after data is available). Addendum VI also established new closure triggers: a directed fishery closes when 92% of an area's sub-ACL is projected to be reached, and the stock-wide fishery closes when 95% of the total ACL is projected to be reached.

Amendment 3 (2016) to the FMP consolidates prior amendments, addenda, and recent management decisions into a single document; it is now the comprehensive document for Atlantic herring management in state waters. The amendment refines the spawning closure system using a modified GSI-based spawning monitoring system. Additionally, the fixed gear set-aside is now available to fixed gear fishermen through December 31.

Addendum I to Amendment 3 was developed to stabilize the rate of catch in Area 1A and distribute the seasonal quota throughout Trimester 2 (June through September). The Addendum includes a variety of management tools which can be used by the Section, including weekly landings limits, restrictions on carrier vessels, vessel declaration requirements, and modifications to the 'days out' procedure for a variety of gear type and permit categories.

II. Status of the Stock

A benchmark stock assessment was published in 2012. An update was released in 2015 to incorporate data through 2014. Both assessments indicate the stock is not overfished and not experiencing overfishing. The next benchmark stock assessment is scheduled for review in 2018.

In the 2015 update, the maximum sustainable yield (MSY) based reference points were updated; the overfishing threshold is $F_{MSY} = 0.24$ and the overfished threshold is $\frac{1}{2}SSB_{MSY} = 342$ million lbs. (155,573 mt). The 2015 update estimated fishing mortality to be 0.16 in 2014 and spawning stock biomass to be 1.3 billion lbs (623,000 mt). The 2012 age-1 recruitment was estimated to be the second largest in the time series and equaled 42.4 billion fish.

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 2016-2018 fishing season, the Council and Commission set the ACL at 231 million pounds (104,800 mt), a 2.6% decrease from the 2013-2015 fishing limits. For all three years, the ACL is further subdivided by Atlantic herring management areas as follows: Area 1A = 66.79 million pounds, Area 1B = 9.9 million pounds, Area 2 = 64.1 million pounds, and Area 3 = 90.16 million pounds. The Area 1A sub-ACL is distributed seasonally with 72.8% available from June 1-September 30 and 27.2% available from October 1-December 31. Underages from June through September may be rolled into the October through December period.

The domestic Atlantic herring fishery is predominantly commercial; recreational catch accounts for less than 1% of landings. Over the time series of 1965 to 2017, annual landings by the United States Atlantic herring fleet generally increased and averaged roughly 131.4 million pounds (59,612 mt). Landings reached the lowest level in 1983, at 51.263 million pounds (23,253 mt), and peaked in 2006 at 268.533 million pounds (121,804 mt).

Catch, in metric tons, from Area 1A is shown in Table 1. Preliminary information from 2017 indicates that 29,164 mt were caught in Area 1A, representing 90.9% of the sub-ACL. Since a directed fishery closes when 92% of an area’s sub-ACL is projected to be reached, there was no closure in the Area 1A fishery in 2017.

Table 1: Area 1A catch, sub-ACL, and associated directed fishery closures from 2013-2017. 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	30,580	29,406	96%	Nov-2
2016	30,524	27,826	91.2%	Oct-18
2017	32,083	29,164**	90.9%**	NA

**Preliminary landings data

2017 Fishing Season

Based on preliminary data provided in state compliance reports, Maine and Massachusetts accounted for 89.4% of the commercial Atlantic herring landings in 2017 (Table 2). Landings generally decreased across the states with the largest decreases occurring in Rhode Island (52% reduction from 2016) and Massachusetts (33% reduction from 2016). The states of New Hampshire and New York did see noticeable increases in landings in 2017, with New Hampshire reporting a 32-fold increase in landings from 2016.

Table 2. 2017 commercial landings by state and percent of total harvest. 2017 landings data is considered preliminary at this time. Source: State compliance reports.

	Commercial Landings (lbs)	Percent of Total
ME	61,204,733	59.1%
NH	2,789,406	2.7%
MA	31,357,614	30.3%
RI	4,535,139	4.4%
CT	40,370	0.0%
NY	81,148	0.1%
NJ	3,491,640	3.4%

Table 3 outlines the ‘days out’ program and effort control measures which were implemented in Area 1A. Based on the accelerated landings of Area 1A quota during Trimester 2 in both 2015

and 2016, and the adoption of Addendum I, the original landing schedule for Area 1A was established at 3 days a week for vessels with a Category A permit. This was subsequently increased to 4, then 5, and then 7 days as it became clear that landings were occurring at a slower pace than the two previous years. Several industry observations indicated that fish were exhibiting atypical behavior and thus were harder to catch. Weekly landings limits for Category A permits likewise increased throughout Trimester 2. On October 1, a 3 days consecutive landings limit was implemented for Trimester 3. This was increased to 7 days once it became clear that landings were below the sub-ACL for Area 1A. Trimester 3 landings continued well into December, creating a longer season than the previous two years (see Table 1).

Table 3: 2017 ‘days out’ program for trimester 2 and 3 in Area 1A.

Trimester	Date Effective	Consecutive Landing Days for Category A Permit	Weekly Landings Limit for Category A Permit	Poundage that can be Transferred to a Carrier Vessel
2	June 1, 2017	3	400,000	80,000
	July 2, 2017	4	600,000	80,000
	July 30, 2017	5	680,000	120,000
	September 17, 2017	7	1,000,000	120,000
3	October 1, 2017	3	NA	NA
	December 18, 2017	7	NA	NA

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 GSI₃₀ 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. Prior to 2017, the GSI₃₀ spawning protocol had been implemented as a 1-year pilot program in 2016.

The Eastern Maine spawning area closed on the default date of August 28th through September 24th, given there was a single sample from the area at the time. The Eastern Maine spawning closure was extended for two additional weeks, closing October 16th through October 30th, after samples indicated a significant number of spawning herring.

In Western Maine, four samples were collected throughout the summer, allowing the GSI₃₀ forecasting model to project a spawning closure starting on September 26th. The closure lasted through October 24th and there was no re-closure in the Western Maine area.

Finally, the Massachusetts/New Hampshire spawning closure began October 1st and continued through October 28th, based on forecasting produced from 15 samples. The closure was extended two additional weeks (October 29th through November 11th) after samples indicated a significant number of spawning herring in the area.

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. Data from the 2017 survey was not available in time for inclusion in the compliance reports; however, data from 2000-2016 show variance in both the number and weight of Atlantic herring per tow across years.

Maine Department of Marine Resources also conducts commercial portside catch sampling. In 2017, 96 sampling events occurred, covering purse seine, mid-water trawl, and small-mesh bottom trips.

New Hampshire Fish and Game Department also conducts a juvenile finfish seine survey in the Great Bay, its tributaries, and other coastal harbors. In 2017, 690 Atlantic herring were observed during the months of June and July.

In 2015, **Massachusetts** Division of Marine Fisheries and UMass-Dartmouth School for Marine Science and Technology (SMAST) applied for the 2016-2018 Atlantic herring Research Set-Aside (RSA), and were awarded the majority of RSA quota. Portside sampling and the River Herring Bycatch Avoidance program were conducted with both the midwater trawl (MWT) fishery (primarily operating out of Massachusetts ports) and the small mesh bottom trawl (SMBT) fishery (primarily operating out of Rhode Island ports). Due to a lack of funds and staffing, portside sampling and bycatch avoidance program with the small-mesh bottom trawl fishery operating out of Rhode Island was discontinued.

The primary goal of the River Herring Bycatch Avoidance 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. The 2017 harvest of Area 1A quota was delayed due to spawning closure extensions, days-out restrictions, and a shift in target species to mackerel, resulting in less than 100% of the quota harvested. As a result, no RSA compensation trips were conducted in Area 1A, and zero of the 909 metric tons of Area 1A RSA herring quota was caught.

Marine Fisheries sampled the Massachusetts MWT fishery, including herring and mackerel landings, at 36% (41 of 114) by trip and 41.5% (7,331 of 17,657 mt) by weight, in 2017. Data from an additional 21 Northeast Fisheries Observer Program (NEFOP) trips and one Maine DMR portside sampled trip landed in MA were incorporated into the bycatch avoidance program. Thus, combined landings coverage of 61.3% was achieved in 2017.

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 2017 suggested a decrease in the relative biomass and abundance of Atlantic herring in Rhode Island waters. An average of 1.28 kg/tow of Atlantic herring was observed in 2017, lower than the 2.72 kg/tow observed during 2016. Similarly, the Atlantic herring abundance index derived from the trawl data decreased from 135.12 fish/tow in 2016 to 84.65 fish/tow in 2017.

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 spring index for 2017 was 0.11 fish/tow or about 92% less than the average of the previous ten years (1.46 fish/tow), and was second lowest in the time series (1984-2017). LISTS 2017 spring abundance was low due in part to the survey missing April sampling. Most of LISTS catches occur in the month of April, prior to herring leaving the Sound. Warming water temperatures in Long Island Sound particularly have affected the timing of Atlantic herring leaving the Sound and Survey catches.

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 2017, 683.6 pounds (5,609 individuals) of Atlantic Herring were caught in the ocean trawl surveys.

V. Status of Assessment Advice

The following research recommendations were included in the 2012 benchmark stock assessment. The 2015 stock assessment update did not provide additional research recommendations.

Research Recommendations from the 54th Northeast Region Stock Assessment for Atlantic Herring (2012)

- a. More extensive stock composition sampling including all stocks (i.e. Scotian Shelf).
- b. Develop (simple) methods to partition stocks in mixed stock fisheries.
- c. More extensive monitoring of spawning components.
- d. Analyze diet composition of archived mammal stomachs and sea bird stomachs.
Improve knowledge on prey size selectivity of mammals and sea birds.
- e. Consider alternative sampling methods such as HabCam.

- f. Research depth preferences of herring.
- g. Simulation study to evaluate ways in which various time series can be evaluated and folded into model.
- h. Evaluate use of Length-based models (Stock Synthesis and Chen model)
- i. Develop indices at age from shrimp survey samples
- j. Evaluate prey field to determine what other prey species are available to the predators that could explain some of the annual trends in herring consumption.
- k. Develop statistical comparison of consumption estimates and biomass from model M.
- l. Consider information on consumption from other sources (i.e. striped bass in other areas) and predators inshore of the survey.
- m. Investigate why small herring are not found in the stomachs of predators in the NEFSC food habits database.
- n. Develop an industry-based LPUE or some other abundance index (Industry Based Survey).
- o. Develop objective criteria for inclusion of novel data streams (consumption, acoustic, larval, etc) and how can this be applied.

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 requested and met the requirements for *de minimis* status in 2018. The state's 2015-2017 combined average commercial landings (96,876 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 2012 stock assessment, the PDT also recommends the following research priorities.

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

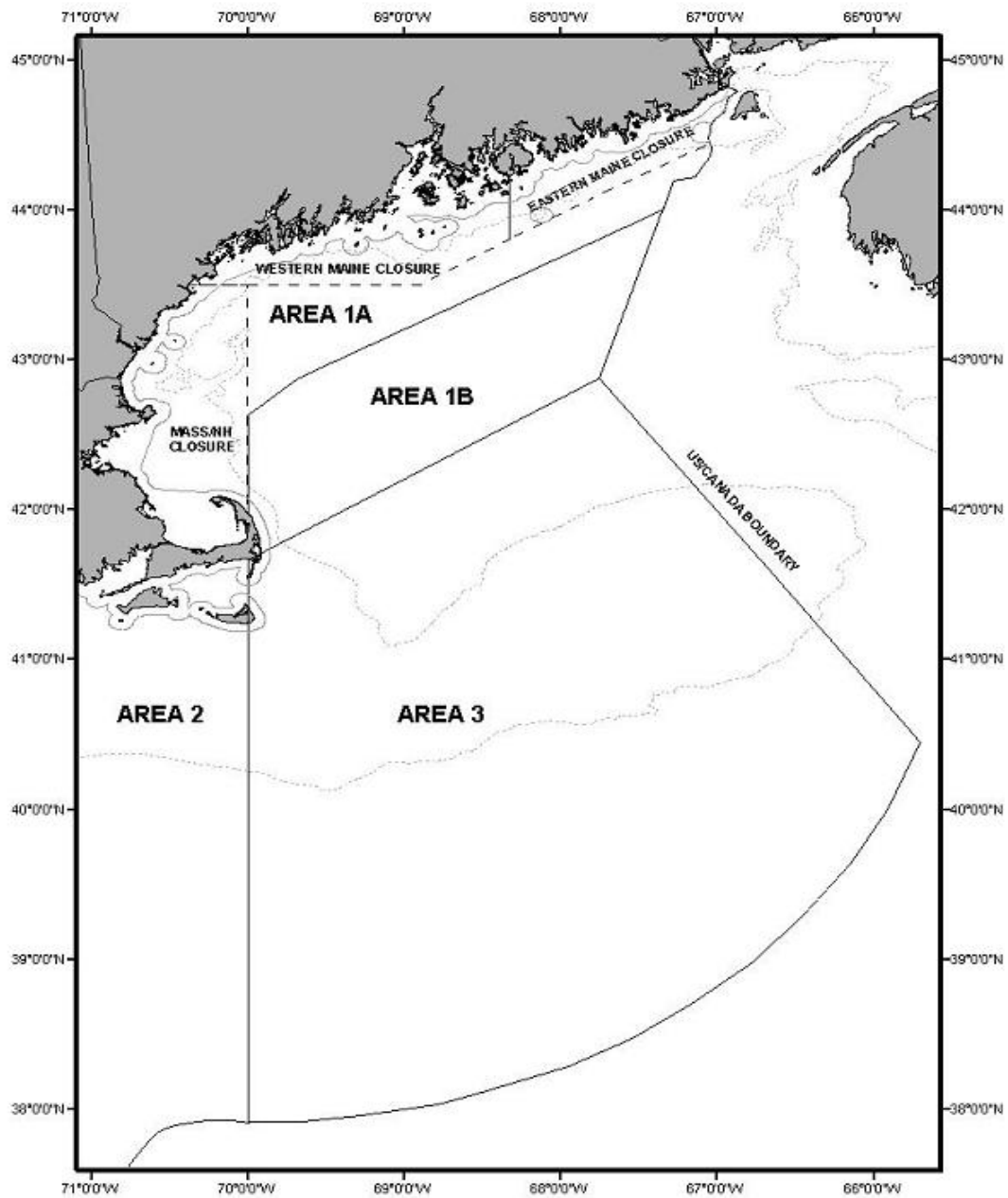


Figure 1. Map of Atlantic herring management areas with boundaries and the three spawning areas are within Area 1A, the inshore region of Gulf of Maine.

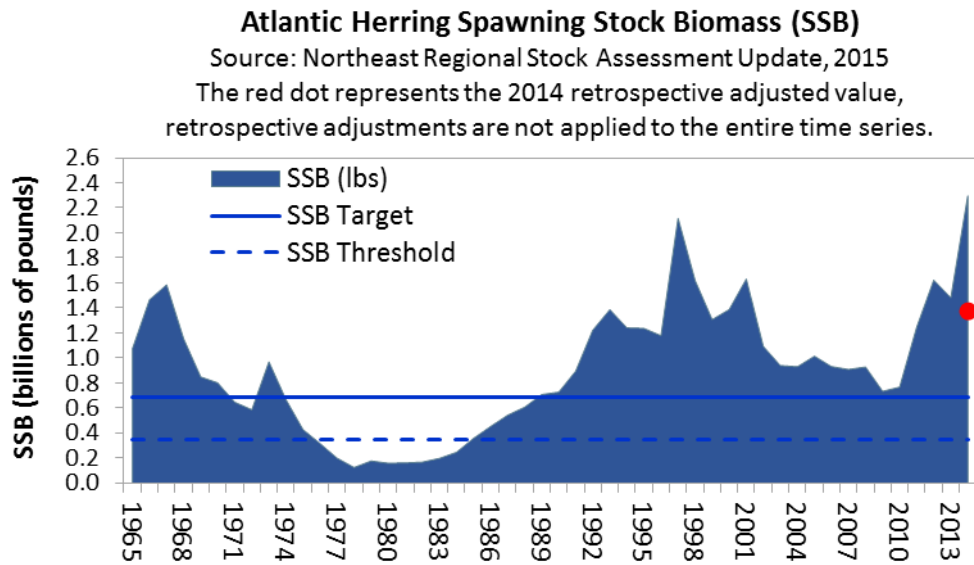


Figure 2. Spawning stock biomass from 1965 to 2014.

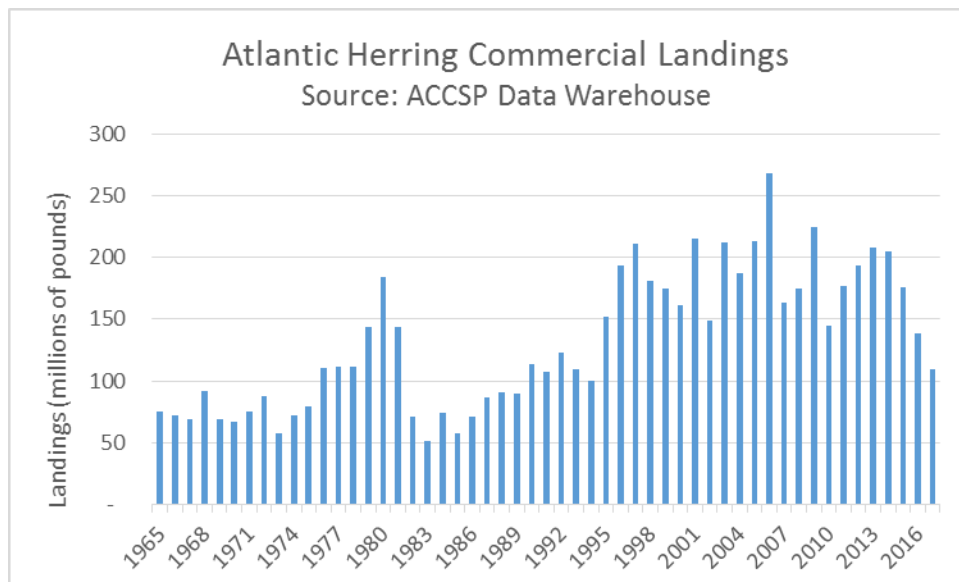


Figure 3. Commercial Atlantic herring landings by the U.S. fleet from 1965-2017