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Draft Discussion Document:
Atlantic Herring Fishery Specifications

for the 2013-2015 Fishing Years
(January 1, 2013 – December 31, 2015)

Prepared by the
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in consultation with
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National Marine Fisheries Service
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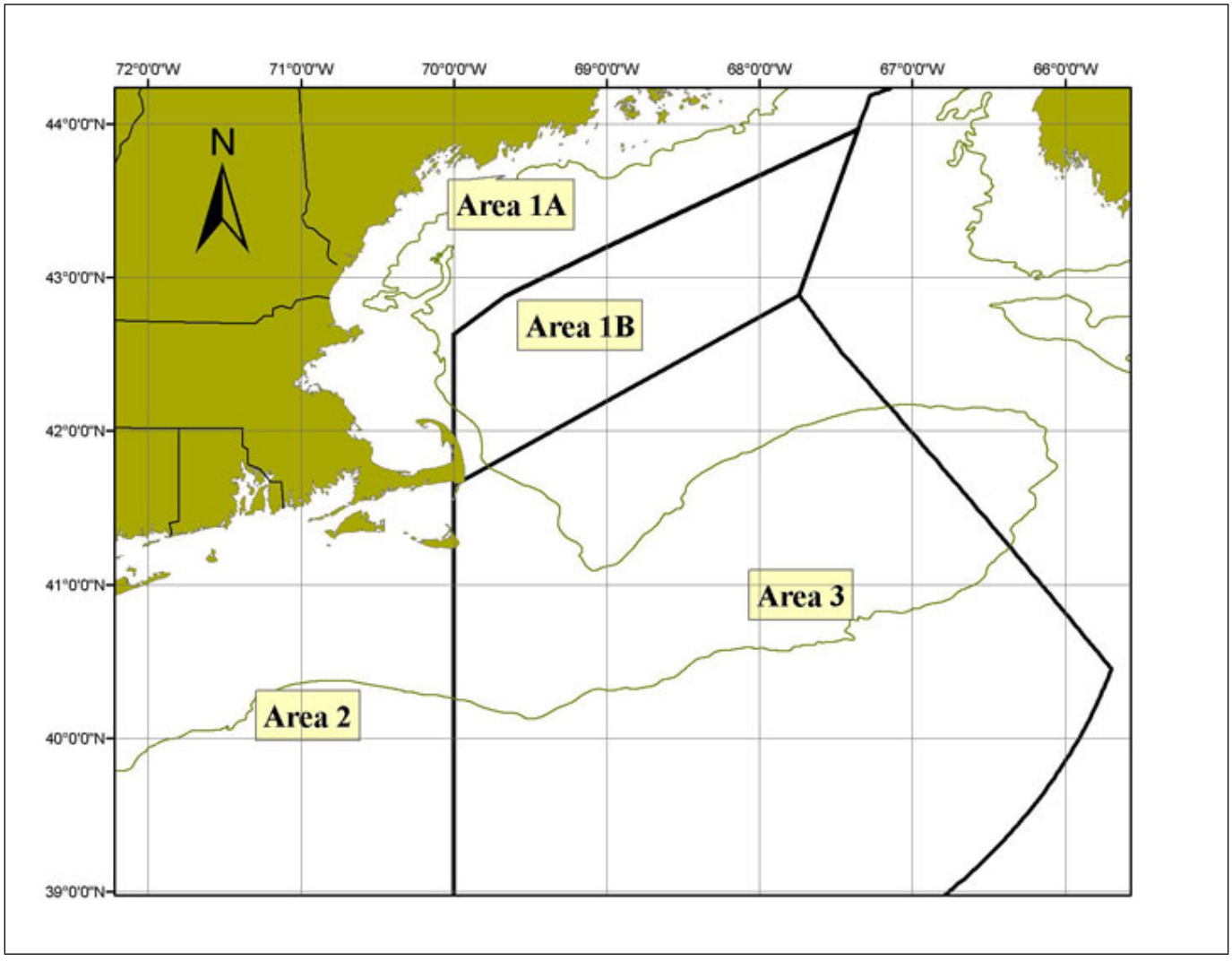
1.0 OVERVIEW

The Atlantic herring (*Clupea harengus*) fishery is managed as one stock complex, but this stock is comprised of inshore and offshore components that segregate during spawning. In recognition of the spatial structure of the herring resource, total allowable catches (TACs) are assigned to four herring management areas. Area 1 is the Gulf of Maine (GOM) divided into an inshore (Area 1A) and offshore section (Area 1B) (Figure 1). Area 2 is located in the coastal waters between MA and NC, and Area 3 is on Georges Bank (GB). Requirements of the Atlantic herring fishery are regulated by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Atlantic Herring Fishery Management Plan (FMP) approved by the National Marine Fisheries Service (NMFS) on October 27, 1999.

Figure 1 Atlantic Herring Management Areas



1.1 2010–2012 ATLANTIC HERRING FISHERY SPECIFICATIONS

The assessments/specifications required by the Herring FMP are made every three years as part of the Atlantic herring fishery specification process. The Herring FMP mandates that the TACs, sub-annual catch limits (ACLs) per Amendment 4, be distributed to four herring management areas on an annual basis. The Council uses the best available information to estimate the proportion of each spawning component of the Atlantic herring stock complex in each area/season and distributes the sub-ACLs such that the risk of overfishing an individual spawning component is set at an acceptably low level.

In Amendment 4, the Council updated the specifications process to ensure consistency with the newly-implemented provisions of the MSA. The Council opted to retain the general provisions for establishing specifications for the Atlantic herring fishery but modified the specifications and eliminated the need to annually specify JVP, IWP, TALFF, and a sub-ACL reserve. While TALFF will not have to be considered by the Council during the specifications process, countries interested in foreign fishing for herring may still request TALFF allocations from NMFS, and these requests will be addressed as they arise.

The provisions to change the fishery specifications and the specifications process were incorporated into Amendment 4 to the Herring FMP (Table 1).

Table 1 Atlantic Herring Fishery Specifications for the 2010-2012 Fishing Years (as Modified by Amendment 4)

SPECIFICATION	2010-2012 ALLOCATION (MT)
Overfishing Limit (OFL)	145,000 – 2010 134,000 – 2011 127,000 - 2012
Acceptable Biological Catch (ABC)	106,000
U.S. Optimum Yield (OY)/Annual Catch Limit (ACL)	91,200
Domestic Annual Harvesting (DAH)	91,200
Domestic Annual Processing (DAP)	87,200
Total Joint Venture Processing (JVPt)	N/A
JVP	N/A
Internal Waters Processing (IWP)	N/A
U.S. At-Sea Processing (USAP)	N/A
Border Transfer (BT)	4,000
Foreign Fishing (TALFF)	N/A
RESERVE	N/A
sub-ACL Area 1A*	26,546
sub-ACL Area 1B	4,362
sub-ACL 2	22,146
sub-ACL 3	38,146
Research Set-Aside (RSA)	None
Fixed Gear Set-Aside (1A)	295

**Specifications included possible allocation of 3,000 additional mt of herring to Area 1A in November and December of each year, depending on landings in the Canadian New Brunswick weir fishery.*

Catch from the New Brunswick (NB) weir fishery is accounted for as part of management uncertainty and deducted from the acceptable biological catch before the total ACL (U.S. OY) is specified (see additional discussion in this document). If NB weir fishery landings through October 15 are less than 9,000 mt, then 3,000 mt will be added to the 1A sub-ACL in November. The 2010-2012 specifications included a provision to allocate an additional 3,000 mt of herring to Area 1A in November for the remainder of the fishing year, based on the level of catch in the New Brunswick (NB) weir fishery. In 2011, landings in the NB weir fishery were 3,711 mt, so 3,000 mt was returned to Area 1A on November 1, 2011 due to the NB weir fishery under harvest. Additionally, 284 mt was returned to the 1A quota due to under harvest in the fixed gear fisheries west of Cutler, ME.

1.2 HERRING CATCH – LANDINGS AND DISCARDS

The herring ACL and management area sub-ACLs are tracked based on total catch–landings and discards. Herring harvesters are required to report discards in addition to landed catch through independent methods. The harvester fills out a hard copy report for each catch by trip (vessel trip report, VTR) and is required to send in these reports monthly (NMFS Gloucester). Harvesters are also required to report the amount of herring caught (landed and discarded) from each management area weekly via telephone (IVR; NMFS Gloucester).

Atlantic Herring Catch Estimates

Table 2 summarizes the Atlantic herring catch estimates by year and management area that were utilized by NMFS for quota/sub-ACL monitoring from 2003-2011. The following describes how catch and/or landings were determined from 2003 to 2011.

- 2003-2006 catch estimates are under quota management implemented through the Atlantic Herring FMP and are based on interactive voice reporting (IVR) data from the call-in system used to monitor TACs.

- 2007-2009 catches are based on IVR data supplemented with dealer data. During 2008 and 2009, TACs for Areas 1A and 1B were reduced for a research set-aside. The RSA for Area 1A was 1,350 mt, and the RSA for Area 1B was 300 mt.

- Catch estimates for the 2010 and 2011(preliminary) fishing years are based on a comprehensive methodology developed by NMFS for quota monitoring in response to Amendment 4 provisions and the need to better monitor sub-ACLs. In general, estimates are based on landings data obtained from dealer reports supplemented with VTRs and discard data from extrapolated observer data (see detailed methodology on the following pages). *The 2011 catch totals are provided by NMFS but are still pending final rule-making.

How Herring Catch is Tracked – Landings

A change to year-end tallying started during the 2010-2012 specifications cycle due to overages in 2010, which resulted in the need for a more timely catch reporting system to better monitor catch against sub-ACLs. NMFS revised vessels reporting requirements (76 FR 54385) on September 2011; limited access herring vessels are now required to report herring catch daily via vessel monitoring systems (VMS), open access herring vessels are required to report catch weekly via the interactive voice response (IVR) system, and all herring-permitted vessels are required to submit vessel trip reports (VTRs) weekly.

NMFS determined final 2010 herring landings based on dealer reports (Federal and state) containing herring purchases, supplemented with VTRs (Federal and State of Maine) containing herring landings. NMFS compared dealer reports to VTRs for all trips that landed herring in 2010. Because VTRs are generally a hail weight or estimate of landings, with an assumed 10% margin of error, dealer reports are assumed to be more accurate source of landings data. However, if the amount of herring reported via VTR exceeded the amount of herring reported by the dealer by 10% or more, it was assumed that the dealer report for that trip was in error. In those instances, the amount of herring reported via VTR was used to determine the amount of herring landed on that trip. Herring landings in the VTR database were checked for accuracy against the scanned image of the paper VTRs submitted by the owner/operator of the vessel. VTR landings were also verified by comparing reported landings to harvesting potential and applicable possession limits for each vessel. Federal dealer reports for 2010 were finalized in June 2011 and state dealer reports for 2010 were finalized in September 2011.

Herring landings reported on VTRs were assigned to herring management areas using latitude and longitude coordinates. VTRs with missing or invalid latitude/longitude coordinates were manually corrected using the statistical area reported on the VTR. If no statistical area was reported on the VTR, then a combination of recent fishing activity and a review of the scanned images of the original VTR were used to assign landings to herring management area. Dealer reports without corresponding VTRs were prorated to herring management area using the proportion of total herring landings stratified by week, gear type, and management area.

As NMFS was reviewing the 2010 herring data, and comparing individual VTRs with individual dealer reports, it resolved data errors resulting from misreporting. Common dealer reporting issues were: missing dealer reports, incorrect or missing VTR serial numbers, incorrect or missing vessel permit numbers, and incorrect dates. VTRs had similar errors. Common VTR reporting issues were: missing VTRs, missing or incorrect dealer information, incorrect amounts of landed herring, incorrect dates, and missing or incorrect statistical area.

The same methodology was utilized by NMFS to determine the 2011 year-end totals (provided in this document as preliminary totals, pending final rulemaking).

How Herring Catch is Tracked – Discards

Initially, NMFS calculated the total herring catch for 2010 and 2011 by adding the amount of herring landings to the amount of herring discarded. The methodology used by NMFS to calculate the amount of landed herring and the amount of discarded herring was reviewed by the Council's Herring Plan Development Team (PDT) in 2011. The Herring PDT recommended that prorated dealer reports should account for fishing effort and seasonality in its calculations. Based on the Herring PDT's recommendations, NMFS revised its methodologies to include stratification by week, gear type, and area for dealer reports that were prorated to management area. Additionally, the Herring PDT recommended that the extrapolation of discards be stratified by gear type and area. NMFS revised its discard methodology accordingly.

Table 3 provides the 2010 and 2011(preliminary) year-end catch totals determined by NMFS, using landings data (dealer reports supplemented with VTRs) and estimated discards (extrapolated using Northeast Fisheries Observer Program, NEFOP, data). Discards were stratified and calculated by herring fishery management area and gear type, then total discards were combined by herring fishery management area. The amount of observed herring discards (''Atlantic herring'' and ''herring unidentified'') was divided by the amount of observed fish landed. This discard ratio was then multiplied by the amount of all fish landed for each trip to calculate total amount of herring discards.

Overages

Since the implementation of Amendment 1, quota overages (shaded rows in Table 2) have been relatively infrequent and minor in scale. Overages have only occurred in Areas 1A and 1B. In terms of magnitude, the largest overage under quota management occurred in Area 1B during the 2006 fishing year, where 3,000 mt additional herring were caught (about 6.6 million pounds). Some of this overage may have been attributable to mis-reporting of management area fished and may have been addressed through the area boundary changes implemented in Amendment 1. Due to the of the high volume and seasonal nature of the fishery and restrictions on fishing times (e.g. days out, spawning restrictions), recent quota overages have tended to occur primarily in the most active areas of the fishery and in years when substantial reductions in quota have been implemented.

Effective February 24, 2012, NMFS reduced the 2012 sub-ACLs in Areas 1A and 1B to account for overages in those areas in 2010. Therefore, the sub-ACL for Area 1A is 24,668 mt (reduced from 26,546 mt) and the sub-ACL for Area 1B is 2,723 mt (reduced from 4,362 mt) for the 2012 fishing year (see Table 4). It appears from preliminary catch totals that there may have been an overage in Area 1A during the 2011 fishing year (Table 3). Once NMFS finalizes the 2011 totals, any overages and subsequent deductions for 2013 will be published in the *Federal Register*.

Table 2 Atlantic Herring Catch by Year and Management Area, 2003-2011

YEAR	AREA NAME	CATCH (MT)	QUOTA (MT)	QUOTA CAUGHT
2003	1A	61,516	60,000	103%
2003	1B	5,271	10,000	53%
2003	2	13,835	50,000	28%
2003	3	20,985	60,000	35%
2004	1A	60,095	60,000	100%
2004	1B	9,044	10,000	90%
2004	2	12,992	50,000	26%
2004	3	11,074	60,000	18%
2005	1A	61,102	60,000	102%
2005	1B	7,873	10,000	79%
2005	2	14,203	30,000	47%
2005	3	12,938	50,000	26%
2006	1A	59,989	60,000	100%
2006	1B	13,010	10,000	130%
2006	2	21,270	30,000	71%
2006	3	4,445	50,000	9%
2007	1A	49,992	50,000	100%
2007	1B	7,323	10,000	73%
2007	2	17,268	30,000	58%
2007	3	11,236	55,000	20%
2008	1A	42,257	43,650	97%
2008	1B	8,671	9,700	89%
2008	2	20,881	30,000	70%
2008	3	11,431	60,000	19%
2009	1A	44,088	43,650	101%
2009	1B	1,799	9,700	19%
2009	2	28,032	30,000	93%
2009	3	30,024	60,000	50%
2010	1A	28,424	26,546	107%
2010	1B	6,001	4,362	138%
2010	2	20,831	22,146	94%
2010	3	17,573	38,146	46%
2011*[1]	1A	30,621	29,251	105%
2011*	1B	3,528	4,362	81%
2011*	2	14,919	22,146	68%
2011*	3	36,966	38,146	97%

Source: NMFS.

**Note the 2011 catch totals are preliminary and pending rulemaking, while the 2003-2010 data is from NMFS year-end catch totals.*

Note the shaded rows indicate overages.

[1]This quota included the additional 284 mt allocated to Area 1A on November 1, 2011 due to under harvest in the fixed gear fisheries west of Cutler, ME. As of the November 18, 2011 summary report, the New Brunswick weir fishery landed 3,711 mt. This quota included the additional 3,000 mt allocated to Area 1A on November 1, 2011 due to under harvest in the New Brunswick weir fishery.

Table 3 Total Catch of Atlantic Herring in 2010-2011

Year	Area	Sub-ACL (mt)	Landed-Herring (mt)	Discarded Herring (mt)	Total Herring Catch (mt)	Herring Catch as % of Sub-ACL
2010	1A	26,546	28,364	60	28,424	107
2010	1B	4,362	5,997	3	6,001	138
2010	2	22,146	20,781	50	20,831	94
2010	3	38,146	17,573	23	17,596	46
2011	1A	29,251	30,621	55	30,676	105
2011	1B	4,362	3,528	2	3,530	81
2011	2	22,146	14,919	81	15,001	68
2011	3	38,146	36,966	71	37,038	97

Source: NMFS year-end totals.
**The 2011 catch totals are preliminary and pending rulemaking.*
Note the shaded rows indicate overages. The rows for 2011 are not shaded due to the totals being preliminary.

Table 4 Atlantic Herring Catch – 2010 and 2011 Overages and Resulting 2012 and 2013 Sub-ACLs

YEAR	AREA NAME	CATCH (MT)	QUOTA (MT)	QUOTA CAUGHT	2012 Quota (MT)
2010	1A	28,424	26,546	107%	24,668
2010	1B	6,001	4,362	138%	2,723
2010	2	20,831	22,146	94%	No change
2010	3	17,573	38,146	46%	No change
YEAR	**AREA NAME**	**CATCH (MT)**	**QUOTA (MT)**	**QUOTA CAUGHT**	**2013 Quota (MT)**
2011*	1A	30,621	29,251	105%	TBD
2011*	1B	3,528	4,362	81%	TBD
2011*	2	14,919	22,146	68%	TBD
2011*	3	36,966	38,146	97%	TBD

Source: NMFS.
**The 2011 catch totals are preliminary and pending rulemaking.*
Note the shaded rows indicate overages.

2.0 SPECIFICATIONS PROCESS AND FORMULAS

The Atlantic herring fishery specifications are annual amounts (for the 2013-2015 fishing years) including:

- Overfishing Limit (OFL),
- Acceptable Biological Catch (ABC),
- A Stock-wide Annual Catch Limit (ACL) = U.S. Optimum Yield (OY),
- Domestic Annual Harvest (DAH),
- Domestic Annual Processing (DAP),
- U.S. At-Sea Processing (USAP),
- Border Transfer (BT, U.S.-caught herring transferred to Canadian vessels for export),
- Management Area sub-ACLs,
- Research Set-Aside (RSA); and
- Fixed Gear Set-Aside (FGSA).

Related definitions and formulas are provided in the following sub-section.

2.1 DEFINITIONS AND FORMULAS

Overfishing Level (OFL). 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 F_{MSY} or its proxy. This specification replaced the previous specification of *allowable biological catch* in the herring fishery.

OFL>=ABC>=ACL

Acceptable Biological Catch (ABC) – The MSA interpretation of ABC includes consideration of biological uncertainty (stock structure, stock mixing, other biological/ecological issues), and recommendations for ABC should come from the Council's SSC. 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.

OFL – Scientific Uncertainty = ABC (Determined by SSC)

ABC Control Rule. The specified approach to setting the ABC for a stock or stock complex as a function of scientific uncertainty in the estimate of OFL and any other scientific uncertainty. The ABC control rule will consider uncertainty in factors such as stock assessment issues, retrospective patterns, predator-prey issues, and projection results.

The ABC control rule will be specified and may be modified based on guidance from the SSC during the specifications process. Modifications to the ABC control rule can be implemented through the specifications package or framework adjustments to the Herring FMP (in addition to future amendments), as appropriate.

Annual Catch Limit (ACL) – A stock-wide ACL will be established that accounts for both scientific uncertainty (through the specification of ABC) and management uncertainty (through the specification of the stock-wide ACL and buffer between ABC and the ACL).

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 equates to optimum yield (OY) and serves as the level of catch that determines whether accountability measures (AMs) become effective.

ABC – Management Uncertainty (Canadian catch, state waters catch, discards – determined by Council) = Stock-wide ACL = OY

Sub-ACLs – Once known as area-based total allowable catch (TAC) levels. This is meant to prevent overfishing on a sub-component level by defining sub-ACLs. If the Council chooses, Accountability Measures (AMs) can be specified for the sub-ACLs within the specifications process, providing further incentives to avoid overfishing a sub-component of the herring stock.

Accountability Measure(s) (AMs). 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.

Domestic Annual Harvest (DAH) – DAH is established based on the expected catch from U.S. fishing vessels during the upcoming fishing year. The Herring FMP specifies that OY is equal to DAH plus a reserve.

OY = DAH + Reserve (only if one is assigned)

The Herring FMP also specifies that domestic annual harvest (DAH) will be composed of domestic annual processing (DAP), the total amount allocated to processing by foreign ships (JVPt), and the amount of herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada (BT).

DAH = DAP + JVPt + BT

***Amendment 4 eliminated JVP, so for the 2013-2015 specifications,**

***DAH = DAP + BT**

Domestic Annual Processing (DAP) - The Herring FMP authorizes the allocation of a portion of DAP for at-sea processing by domestic processing vessels that exceed the current size limits (U.S. at-sea processing, USAP).

U.S. At-Sea Processing (USAP) -When determining the USAP allocation, the Council should consider the availability of other processing capacity, development of the fishery, status of the resource, and opportunities for vessels to enter the herring fishery.

Border Transfer (BT) - The amount of herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada, (4,000 mt for the 2010-2012 specifications).

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

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

Table 5 Overview of Definitions

Acronym	Definition	Formula	Considerations
OFL	Overfishing Limit	Catch at $F_{Threshold}$*B	Current stock size
ABC	Acceptable Biological Catch	Catch at F_{MSY} or $F_{rebuild}$ <=OFL or OFL – Scientific Uncertainty = ABC (Determined by SSC)	Biological uncertainty over current stock size, estimate of F, or other parameters (stock mixing ratios, recruitment, etc.)
ACL	Annual Catch Limit	<=ABC or ABC – Management Uncertainty = Stock-wide ACL = OY	Uncertainty from other sources, evaluation of risk to achieving management goals if ABC is exceeded
Sub –ACLs	Sub Annual Catch Limit	Closure at 95% of the ACL in any FMA	To prevent overfishing on a sub-component level
AM	Accountability Measures	None	(1) minimizing risk of exceeding ACL during the fishing year; (2) addressing ACL overages, if they occur

2.2 GENERAL OVERVIEW/TIMELINE FOR SPECIFICATIONS PROCESS

Most of the milestones within the specifications process result from the National Standard (NS) 1 Guidelines. For instance, the NS 1 Guidelines state, in Section 600.310 (f)(3).

> *Specification of ABC. ABC may not exceed OFL. Councils should develop a process for receiving scientific information and advice used to establish ABC. This process should: Identify the body that will apply the ABC control rule (i.e. calculates the ABC), and identify the review process that will evaluate the resulting ABC. The SSC must recommend the ABC to the Council.*

Consequently, the Council established, within the Proposed Action, that the Herring PDT would first develop recommendations for the SSC to consider setting ABC. The SSC would then make a final recommendation to the Council, as per the provisions in Amendment 4. The ACL process is very similar in structure. All the new administrative steps established in the Proposed Action were developed by the Council in a similar manner to the example, to explain how the specifications process would function in the future in order to insure compliance with the MSA (see Table 6).

Table 6 General Atlantic Herring Fishery Specifications Timeline

Action	Schedule
1. SAW/SARC 54	June 5-9, 2012
2. PDT Meeting	August 14, 2012
3. SSC recommend ABC	September 4, 2012
4. Herring Committee (OS) Meeting	September 20, 2012
5. NEFMC Meeting – First Specs Meeting	September 25-27, 2012
6. NEFMC Meeting – Final Specs Meeting	November 13-15, 2012

2.3 2013-2015 PROPOSED ATLANTIC HERRING SPECIFICATIONS TABLE

Table 7 Proposed Atlantic Herring Fishery Specifications for the 2013-2015 Fishing Years

SPECIFICATION	2013-2015 ALLOCATION (MT)
OFL*	169,000 – 2013 127,000 – 2014 104,000 - 2015
ABC	OFL- Scient. Unc.
U.S. OY/ACL	ABC – Mgt. Unc.
DAH	xxx
DAP	xxx
USAP	xxx
BT	xxx
sub-ACL Area 1A*	xxx
sub-ACL 1B	xxx
sub-ACL 2	xxx
sub-ACL 3	xxx
Research Set-Aside	xxx
Fixed Gear Set-Aside (1A)	xxx

**OFL values are proposed based on SAW 54 and the formula for OFL (see Section 4.0).*

3.0 SAW/SARC 54

The Stock Assessment Review Committee (SARC) of the 54th Northeast Regional Stock Assessment Workshop (SAW 54) met in June 2012 to review the Northeast regional benchmark stock assessment of Atlantic herring in Woods Hole, MA. A statistical catch-at-age model (Age Structured Assessment Program, ASAP; Legault and Restrepo 1999) was proposed as the best scientific information for determining Atlantic herring stock status. The SARC 54 Panel recognized natural mortality (M), the 2008 year class, and Biological Reference Points (BRPs) as scientific uncertainties. The spawning stock biomass (SSB) was estimated at 517,930 mt in 2011 and fishing mortality rate at age 5 (F) was estimated to be 0.14. Age 5 was used because it is fully selected in the mobile gear fleet, which accounted for much of the catch in recent years.

This assessment included significant changes from previous assessments, with almost all data inputs and model settings being reconsidered. For example, catches from all sources were combined in previous assessments, but catch-at-age was partitioned into mobile and fixed gear fleets in the new formulation of the ASAP model. Furthermore, age - and time-varying natural mortality rates were developed and herring consumption by various predators justified a 50% increase in natural mortality beginning in 1996, whereas natural mortality equaled 0.2 for all ages and years in previous assessments. Selectivity in the SAW/SARC 54 assessment was also estimated for any data source with age composition, but was fixed in previous assessments. Lastly, maturity-at-age varied among years in this assessment, but held constant in previous assessments.

Biological Reference Points (BRPs)

The BRPs from SAW/SARC 54 were based on the fit of a Beverton-Holt stock-recruitment curve (estimated internally to ASAP model) and other inputs from the terminal year of the assessment (i.e., 2011) (Table 8). The BRPs were affected by the 50% increase in natural mortality beginning in 1996, and so are considered uncertain (see below). The 2009 reference points are from the previous TRAC 2009 assessment and were based on the fit of a Fox surplus production model.

The BRPs seen in Table 8 differ due to (1) differences in natural mortality assumptions between assessments (i.e., SAW/SARC 54 used age-and time-varying M with a 50% increase beginning in 1996 and TRAC 2009 used 0.2 for all ages and years), and (2) the methods used to estimate the BRPs (Fox model was used in TRAC 2009 and the Beverton-Holt (BH) stock-recruitment curve estimated within ASAP for SAW/SARC 54).

Table 8 Atlantic Herring Biological Reference Points

Reference Points	TRAC 2009	SAW/SARC 54 (June 2012)
F_{MSY}	0.27	0.27
B_{MSY}	670,000 mt (1/2 SSB_{MSY} = 335,300)	157,000 mt (1/2 SSB_{MSY} = 78,500)
MSY	178,000 mt	53,000 mt

A discussion on the four new and unique data approaches used in the 54th SAW/SARC benchmark assessment of Atlantic herring is provided in Section 5.2.

3.1 SPAWNING STOCK BIOMASS (SSB)

The herring total and spawning stock biomass increased after 2009, mostly due to the large 2008 year class. The estimated 2011 January 1 total biomass of Atlantic herring was 1,322,446 mt. Based on the ASAP model, SSB was 517,930 mt in 2011. SSB declined during 1997-2010, and ranged from 180,527 mt in 1982 to a max of 1,936,769 mt in 2009. Total biomass and SSB showed similar trends over time, but 1-2 year lags caused by total biomass being reflected immature recruits rather than SSB.

3.2 FISHING MORTALITY (F)

Fishing mortality (F) rates in 2010 and 2011 were relatively low due to the presence of the strong 2008 year class, which increased the stock biomass. Fishing mortality in 2011 equaled 0.14, but is not representative of fishing mortality rates in recent years which averaged 0.23 during 2000-2009.

3.3 2008 ATLANTIC HERRING YEAR CLASS (2009 ATLANTIC HERRING AGE-1 COHORT)

The SAW/SARC 54 assessment estimated the 2008 year class as the largest recruitment on record, totaling 59.4 billion age-1 fish in 2009 (see Figure 2 on p 20). The signal for this cohort was consistently seen in all sources of data that contain age composition. The average age-1 recruitment has been below the 1996-2011 average of 15.8 billion fish except for the 2008 year class, which is seen as prominent in the recent stock biomass increase and will be a significant component of projected yield in the immediate future.

The spawning stock and total biomass increased after 2009, most likely due to the strong 2008 year class. The sensitivity of the stock status was tested on the 2008 year class on projections through 2015 at $F_{MSY.}$ A projection of the 2008 year class was cut in half to approximately equal previous high recruitments and the probability of the stock being overfished or overfishing to occur still remained at zero. A Beverton-Holt relationship was also used to conduct a sensitivity run with variation of the annual recruitments (CV in base = 1, CV in sensitivity = 0.67) and with these additional restrictions on recruitment variation, the 2008 year class would still be the largest on record.

3.4 STOCK STATUS – OVERFISHING DEFINITION

The current overfishing definition (Atlantic Herring FMP, 1999) for Atlantic herring is provided below.

> *If stock biomass is equal or greater than B_{MSY} , overfishing occurs when fishing mortality exceeds F_{MSY}. If stock biomass is below B_{MSY} , overfishing occurs when fishing mortality exceeds the level that has a 50 percent probability to rebuild stock biomass to B_{MSY} in 5 years ($F_{Threshold}$). The stock is in an overfished condition when stock biomass is below ½ B_{MSY} and overfishing occurs when fishing mortality exceeds $F_{Threshold}$. These reference points are thresholds and form the basis for the control rule.*
>
> *The control rule also specifies risk-averse fishing mortality targets, accounting for the uncertainty in the estimate of F_{MSY}. If stock biomass is equal to or greater than 1/2B_{MSY} , the target fishing mortality will be the lower level of the 80 percent confidence interval about F_{MSY}. When biomass is below B_{MSY} , the target fishing mortality will be reduced consistent with the five-year rebuilding schedule used to determine $F_{Threshold}$.*

*The Herring PDT notes there may be an error or inconsistency in the language related to the rebuilding schedule and recommends that this overfishing definition be reviewed at the next appropriate discussion.

The 2012 SAW 54 benchmark assessment results estimated that Atlantic herring SSB in 2011 was 517,930 mt, which is well above B_{MSY} (157,000 mt). Estimated fishing mortality in 2011 was 0.14, which is below F_{MSY} (0.27). Therefore, the stock is not overfished and overfishing is not occurring. In fact, the stock is considered to be completely rebuilt.

4.0 OVERFISHING LIMIT (OFL) 2013-2015

Overfishing Limit (OFL). 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 F_{MSY} or its proxy.

OFL>=ABC>=ACL

OFL = $F_{threshold}$ * B (2011 Biomass)

$F_{threshold}$ = F_{MSY} (when stock is not overfished or overfishing is not occurring)

A fishing level based on MSY or F_{MSY} is identified as the starting point for specifying Optimum Yield (OY) and management area sub-ACLs when the herring stock complex is not overfished and overfishing is not occurring. The F_{MSY} fishing level was estimated in SAW 54 projections as **168,775 mt in 2013, 126,589 mt in 2014, and 104,430 mt in 2015 and are rounded to the nearest thousand metric tons** for the proposed OFL specifications (see Table 9).

The following will describe how fishing mortality (F), spawning stock biomass (SSB), and catch are derived. Fishing mortality is derived from the estimate of F_{MSY} (i.e. 0.27) that was derived during the 2012 stock assessment. A simulation of 1000 projections is then used to capture possible outcomes of SSB and landings for 2013-2015. The values seen in Table 9 are derived from the 2012 fishing mortality deaths, which are based on the 2012 ACL and are specified by the 2012 natural mortality rates equal to the natural mortality rates used in the assessment in 2011. The 2013 fishing mortality deaths are based on the F_{MSY} fishing rate and are specified by the 2013 natural mortality rates equal to the natural mortality rates used in the assessment in 2011. Consequently, the 2012 SSB depends on the 2012 ACL and the 2013 SSB depends on the F_{MSY} fishing rate.

The two key elements used in the projections are abundance (used 2012 projections) and recruitment (used each year for each projection). The numbers-at-age (for 2012) are randomized for each of the 1000 projections by drawing the abundance at age from the probability distributions. Once the numbers at age are projected, then the population of each projection is derived for each year, using the 2012 numbers at age to the fishing mortality rate that was specified. SSB and landings are calculated in the same manner.

The SSB and OFL values in Table 9 are decreasing throughout the time series (2013-2015) as fishing mortality remains constant at 0.267. SSB remains above B_{MSY} of 157,000 mt (1/2 SSB_{MSY} = 78,500 mt) throughout 2013-2015. The decrease in SSB and catch is relative to the large size of the 2008 year class and is especially unique to the 2013-2015 assessment.

Table 9 Projected F_{MSY} Based Fishing Level (OFL) – Atlantic Herring 2013-2015

YEAR	**2013**	**2014**	**2015**
F_{MSY}	0.267	0.267	0.267
SSB (Spawning Stock Biomass)	494,064 mt	368,501 mt	308,949 mt
Catch in mt (OFL)*	169,000 mt	127,000 mt	104,000 mt

**Proposed OFL values for 2013-2015.*

5.0 SCIENTIFIC UNCERTAINTY AND ABC

The specification of ABC will consider scientific uncertainty and will be recommended to the Council by its Scientific and Statistical Committee. ABC is set based on the OFL reduced by a buffer for scientific uncertainty.

OFL – Scientific Uncertainty = ABC (Determined by SSC)

OFL>=ABC>=ACL

ABC Control Rule. The specified approach to setting the ABC for a stock or stock complex as a function of scientific uncertainty in the estimate of OFL and any other scientific uncertainty. The ABC control rule will consider uncertainty in factors such as stock assessment issues, retrospective patterns, predator-prey issues, and projection results.

Section 600.310 (f)(2)(ii) of the NS 1 guidelines states:

> *Acceptable biological catch (ABC) is a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and any other scientific uncertainty, and should be specified based on the ABC control rule.*

5.1 BACKGROUND: SCIENTIFIC UNCERTAINTY 2010–2012

During the development of the 2010-2012 herring fishery specifications, the Council considered factors identified by the SSC when setting ABC and accounting for scientific uncertainty, including a retrospective pattern that resulted in an overestimation of stock biomass, MSY reference points estimated from the biomass dynamics model are inconsistent with the age-based - stochastic projection, recruitment, biomass projections, and the importance of herring as a forage species.

Acceptable biological catch (ABC) for Atlantic herring was set at 106,000 mt for 2010-2012. A stock-wide ACL was established that accounted for both scientific uncertainty (through the specification of ABC) and management uncertainty (through the specification of the stock-wide ACL and a buffer between ABC and the ACL) (see Table 10).

Table 10 Scientific Uncertainty for 2010-2012

Year	OFL (mt)	ABC (mt)	"Buffer" for Scientific Uncertainty (mt)
2010	145,000	106,000	39,000
2011	134,000	106,000	28,000
2012	127,000	106,000	21,000

During the 2010-2012 specifications process the SSC pointed out two sources of considerable scientific uncertainty:

> *(1) The assessment has a strong 'retrospective pattern' in which estimates of stock size are sequentially revised downward as new data are added to the assessment; and (2) Maximum sustainable yield reference points estimated from the biomass dynamics model are inconsistent with the age-based, stochastic projection; such that fishing at the current estimate of F_{MSY} is expected to maintain equilibrium biomass that is less than the current estimate of B_{MSY}.*

Other sources of uncertainty were also discussed regarding recruitment, biomass projections, and herring as a forage species. Exploitable biomass was projected to decline during 2010–2012 due to the recruitment of poorer than average year-classes. Furthermore, the risk of depleting spawning components and the role of herring in the ecosystem as a forage species was also considered. Given the substantial uncertainty in the 2010-2012 assessment, the Council was urged to consider a conservative catch limit. Although uncertainty in stock size and recruitment generated uncertainty in forecast results, a formal risk analysis was not undertaken due to the significant retrospective pattern in SSB and the difficulty and uncertainty in selecting the final model formulation. Regarding the allocations for the 2011 and 2012 fishing years – total stock biomass was projected to decrease (from the assessment projections), as with the OFL.

Given this magnitude of uncertainty the SSC was unable to provide final guidance regarding an ABC control rule. As such, an interim ABC control rule was set until a new benchmark assessment could be produced.

Interim ABC Control Rule

On January 25, 2010, the Council decided that the interim control rule for ABC would be based on the SSC recommendations. **The interim ABC control rule is:**

ABC = Average Catch (2006-2008)

The interim control rule serves as a placeholder until a more appropriate control rule is developed. In addition to the ABC advice, the SSC also recommended that a new benchmark assessment be scheduled as soon as possible, preferably in advance of the next management cycle. This would allow the SSC to create an ABC control rule for the next specifications process.

5.2 SCIENTIFIC UNCERTAINTY 2013-2015

5.2.1 Background

There were four new data approaches used for the 2013-2015 specifications (almost all data inputs and model settings were reconsidered):

A. US catch data were separated into two gear types, fixed and mobile gears during 1964-2011;

B. Natural mortality during the 2009 TRAC assessment was assumed to equal 0.2 for all ages and years, natural mortality rates were increased by 50% to resolve the retrospective pattern and to match consumption estimates (section 3.1.1);

C. Estimated selectivity for any survey with age composition data, which is in contrast to the 2009 TRAC which used age-specific indices and lastly;

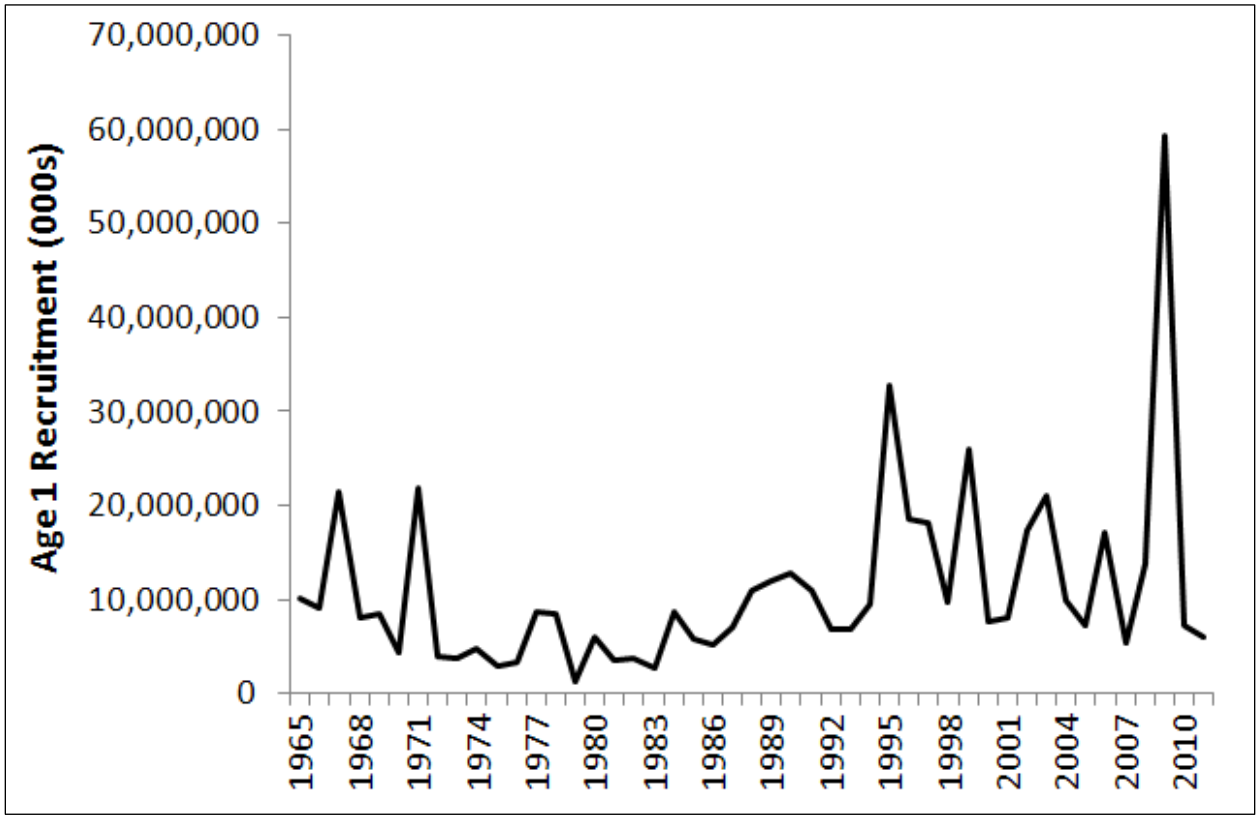
D. Maturity at age varied through time in the 2012 assessment, but was constant among years in the 2009 TRAC assessment.

The SAW/SARC 54 assessment did not have the same problems with retrospective patterns or inconsistent biological reference points as in the TRAC 2009 assessment. Rather after largely resolving the retrospective pattern, the three main sources of scientific uncertainty regarding Atlantic herring from this assessment included: the estimate of the 2008 year class, natural mortality, and the Biological Reference Points (BRPs).

5.2.2 2008 Atlantic Herring Year Class

During SAW 54, the Atlantic herring 2008 year class was estimated to be the largest on record (Figure 2). The strength of large cohorts, however, can often be overestimated in the short-term. The sensitivity of the stock status projections to the size of this year class was evaluated by running the projections through 2015 with the size of the cohort cut in half. The sensitivity runs were also conducted to evaluate the size of the year class with the variation of the annual recruitments from the underlying Beverton-Holt relationship being more restricted than in the base model (see Section 3.3 for more information).

Figure 2 Atlantic herring age-1 recruitment (000s) over time, estimated from the ASAP model base run.



Source: NEFSC

5.2.3 Natural Mortality (M)

Natural mortality was based on a combination of the Hoenig and Lorenzen methods, with the Hoenig method providing the scale of natural mortality and the Lorenzen method defining how natural mortality declined with age (Hoenig 1983; Lorenzen 1996). Natural mortality rates during 1996-2011 were increased by 50% to resolve a retrospective pattern and to ensure that the implied levels of consumption were consistent with observed increases in estimated consumption of herring. Consumption estimates were based on food habits data primarily for groundfish, but also informed by consumption estimates from marine mammals, highly migratory species, and seabirds. The 50% increase in natural mortality implies a decrease in sustainable yield (i.e. lower MSY absent the increase), such that monitoring for changes in predator consumption rates remains of particular importance.

The Herring PDT reviewed the SAW 54 Assessment and discussed assumptions about natural mortality (M) and changes made in the assessment model. The PDT agrees that natural mortality and consumption of herring by predators has been addressed in this assessment to the extent possible. Addressing M in this manner seems appropriate given herrings role as a forage species and appears to be consistent with other sources of information regarding food consumption and

predation. Natural mortality and consumption have been evaluated in this assessment more thoroughly than assessments for other species in the Northeast Region.

5.2.4 Biological Reference Points (BRPs) and Other Uncertainty

Uncertainty in the MSY BRPs is principally driven by two factors: 1) uncertainty in the estimate of the steepness parameter of the stock-recruitment relationship, and 2) the 50% increase in natural mortality during 1996-2011. For example, over approximately 95% confidence intervals for steepness (0.35-0.85), MSY ranged from 40,000 to 78,000 mt, SSB_{MSY} ranged from 73,000 to 277,000 mt, and F_{MSY} ranged from 0.12 to 0.7. Stock status in 2011, however, was robust to this uncertainty, with a broad range of comparisons resulting in the conclusion of overfishing is not occurring and the stock is not overfished ($SSB > ½ SSB_{MSY}$ and $F < F_{MSY}$). Also as noted above, the 50% increase in natural mortality during 1996-2011 implies a decrease in sustainable yield (e.g., lower MSY than if the increase were not present).

Some "qualitative uncertainty" may exist in regards to the exclusion of the acoustic survey and the Atlantic herring stock structure particularly along the Scotian shelf. The acoustic survey was excluded from the 54th SAW/SARC benchmark assessment of Atlantic herring because of an unexplainable drop in the abundance index after the first three years of the survey. Also, the acoustic survey only covers a variable proportion of the stock (Georges Bank stock during spawning), providing limited data. Tagging suggests that the Scotian shelf stock likely mixes with the Gulf of Maine and Georges Bank stocks, however the degree of mixing is unknown and there are no current methods developed at this time.

5.3 ADDITIONAL INFORMATION TO CONSIDER WHEN SPECIFYING ABC

The following additional information is provided as background for SSC consideration when addressing scientific uncertainty and specifying ABC for the upcoming fishing years. Additional information, data, and projections can be found in the SAW 54 assessment document.

1. Setting ABC as Projected Catch at F=75% F_{MSY}

This approach has been a default ABC control rule utilized by the SSC in some cases to address uncertainty. The SSC recommended that the Council should consider an Acceptable Biological Catch (ABC) specification that uses the same method for all stocks, similar to guidelines for stocks that have not rebuilt at the end of the required building period:

A. ABC should be determined as the catch associated with 75% of F_{MSY}.
B. If fishing at 75% of F_{MSY} does not achieve the mandated rebuilding requirements for overfished stocks, ABC should be determined as the catch associated with the fishing mortality that meets rebuilding requirements ($F_{rebuild}$).
C. For stocks that cannot rebuild to B_{MSY} in the specified rebuilding period, even with no fishing, the ABC should be based on incidental bycatch, including a reduction in bycatch rate (i.e., the proportion of the stock caught as bycatch).
D. Interim ABCs should be determined for stocks with unknown status according to case-by-case recommendations from the SSC.

The most recent assessment classifies Atlantic sea herring as not overfished with overfishing not occurring. It is not in a rebuilding plan. Following previous SSC guidance, ABC could be set at the projected catch from F= 75% F_{MSY}. Projected catch and SSB at 75% F_{MSY} for 2013-2015 are shown below in Table 11. The SSB and resulting catch decrease from 2013 to 2015 at this projection and are less than the values in the projections seen in Table 9 (F_{MSY} projection) represented in Section 4.0 (OFL).

Table 11 Projected Catch and SSB at F75% $_{MSY}$ - Atlantic Herring 2013-2015

YEAR	2013	2014	2015
F_{MSY}	0.2	0.2	0.2
SSB (Spawning Stock Biomass)	523,243 mt	409,309 mt	354,559 mt
Catch *	130,025 mt	102,470 mt	87,574 mt

**Potential ABC values for 2013-2015 using a 75% F_{MSY} approach.*

In many cases, 75% of F_{MSY} provides a slightly lower catch than fishing at F_{MSY}, however, many stocks, use $F_{40\%MSY}$ proxies for F_{MSY}. The fundamental idea is that one would take slightly less catch than F_{MSY} with less effort (costs) so that there would be a net gain in value. Ultimately, with respect to groundfish, the Groundfish PDT presented evidence that the 75% F_{MSY} approach did not adequately account for scientific uncertainty in the most recently-updated assessments.

2. "Constant Catch"

The Herring PDT also discussed whether a constant catch approach is an option to consider when specifying a level for ABC. Constant catch may allow for better business planning and more stability in the fishery and may be possible given the current (rebuilt) status of the stock. This approach was utilized for setting ABC during the 2010-2012 specifications (average catch 2006-2008).

However, there are tradeoffs to this approach, as catch may be foregone in earlier years to allow for more catch in later years in comparison to F_{MSY} in Table 9 (catch will always be at less than the 50% threshold due to the chance of overfishing as well as a loss of quota in the first two years due to the fact that biomass will still decrease even at a constant catch rate). As an example, Table 12 provides the data projecting F at a constant catch for 2013-2015 regarding Atlantic herring. The SSB numbers decrease from 2013-2015 at this projection and the OFL catch remains at 114,000 mt.

Table 12 Projected Catch and SSB Under a Constant Catch Approach for Specifying ABC– Atlantic Herring 2013-2015

YEAR	2013	2014	2015
F (Fishing Mortality)	0.17	0.22	0.27
SSB (Spawning Stock Biomass)	533,289 mt	411,951 mt	338,991 mt
Catch *	114,000 mt	114,000 mt	114,000 mt

**Possible ABC values for 2013-2015 using a constant catch approach.*

6.0 MANAGEMENT UNCERTAINTY AND SPECIFICATION OF A STOCK-WIDE ACL/OY

An additional element of any buffer established between the OFL and OY relates to what is defined in Amendment 4 as management uncertainty. Once scientific uncertainty and management uncertainty are deducted, the U.S. optimum yield (OY) specification represents a stock-wide annual catch limit (ACL). Amendment 4 states that management uncertainty should be addressed prior to establishing ACLs, and deductions should be made from ABC, if necessary, to account for management uncertainty.

ABC – Management Uncertainty (Canadian catch, state waters catch, discards – determined by Council) = Stock-wide ACL = OY

Similarly, the provisions in the Herring FMP currently include a deduction to account for Canadian catch prior to specifying a U.S. OY. Consistent with this approach (and with the 2010-2012 specifications), and to ensure consistency with Amendment 4 in 2013-2015, three sources of management uncertainty should be considered during the development of the 2013-2015 specifications prior to setting OY:

A. Canadian Catch

B. State Waters Catch

C. Herring Discards

Each of these three sources of management uncertainty will be discussed below for 2010-2012 as well as 2013-2015. There do not appear to be any new/additional sources of management uncertainty to consider for 2013-2015.

For the 2010-2012 fishery specifications, management uncertainty was set at **14,800 mt**, which was deducted from ABC to specify the overall ACL/OY. The entire deduction for management uncertainty during 2010-2012 was to account for catch in the New Brunswick weir fishery (see following discussion).

6.1 CANADIAN CATCH/NB WEIR FISHERY

Catch of the Gulf of Maine/Georges Bank ***Atlantic herring*** stock complex in Canadian waters consists primarily of fish caught in the New Brunswick (NB) weir fishery (the SARC 54 Panel noted that the Atlantic herring stock on the Scotian Shelf region is unknown). Currently, the Herring FMP assumes that 20,000 mt of fish from the inshore component of the Atlantic herring resource will be taken annually in the NB weir fishery for the 2010-2012 specifications. This assumed catch is subtracted from the available yield from the inshore component of the resource before sub-ACLs are determined for management areas in the U.S. EEZ. While the NB weir catch has been quite variable over time, the 20,000 mt assumption has been determined in previous years to be appropriate. The language in Amendment 1 provides flexibility to reconsider this assumption and adjust according to trends in the fishery in future years as part of the fishery specification process.

The Council proposed to deduct **14,800 mt** from the ABC to account for potential catch of Atlantic herring in the NB weir fishery for the 2010-2012 specifications. NMFS monitored NB weir fishery landings, which are made available by Canada's Department of Fisheries and Oceans (DFO) on a close to real-time basis (within 2 weeks). If, by considering landings through October 15 of each year, NMFS determines that less than 9,000 mt has been taken in the NB weir fishery, NMFS will allocate an additional 3,000 mt to Area 1A to be made available to the directed herring fishery during November and through the remainder of the fishing year (until it is harvested). This specification provides additional opportunity for fishing in Area 1A if catch in the NB weir fishery is substantially less than the deducted amount (14,800 mt), while still minimizing the likelihood that ABC would be exceeded.

- The NB weir fishery catch is quite variable and dropped to just under 6,500 mt in 2008. The NB weir fishery landings totaled about 30,944 mt in 2007 and 6,448 mt in 2008.
- The most recent five-year average of NB weir landings (2007–2011) is 11,218 mt, and the most recent ten-year average (2002-2011) is 12,358 mt.
- Extremely low landings during the 2008 fishing year decreased these moving averages, especially the ten-year average.
- The 2010 fishing year had NB weir landings of 10,958 mt and decreased in 2011 to 3,711 mt (Table 13).

Table 14 provides the number of active weirs in the fishery and catch per weir from 1978-2011. The data indicate a decreased effort overall, with 2009 and 2011 having only 38 and 37 active weirs respectively, down from a high of 210 weirs in 1979. Although, standardized effort (catch per weir) has been highly variable year to year.

Table 15 provides the monthly weir landings for NB from 1978 to 2010 (2011 data not yet available). These data illustrate that the NB weir fishery is primarily a late summer/fall fishery with very little activity occurring during the winter and later part of the year. There were no weir landings in November and December in 2009, and only 46 mt landed during those months in 2010. Note that the most current monthly weir landings showing reduced catch Table 15 (2008-2010) also coincide with the reduced level of effort seen in Table 14.

Table 13 Total Atlantic Herring Catch During, 1964 – 2011

YEAR	US Fixed Gear Catch (mt)	Mobile Gear (mt)	New Brunswick Weir (mt)	US Fixed + NB Weir (mt)
1964	31484	142156	29432	60916
1965	36440	58161	31682	68122
1966	23178	162022	35602	58780
1967	17458	258306	29928	47386
1968	24565	421091	32111	56676
1969	9007	362148	25643	34650
1970	4316	302107	15070	19386
1971	5712	327980	12136	17848
1972	22800	225726	31893	54693
1973	7475	247025	19053	26528
1974	7040	203462	19020	26060
1975	11954	190689	30816	42770
1976	35606	79732	29207	64813
1977	26947	56665	19973	46920
1978	20309	52423	38842	59151
1979	47292	33756	37828	85120
1980	42325	57120	13526	55851
1981	58739	26883	19080	77819
1982	15113	29334	25963	41076
1983	3861	29369	11383	15244
1984	471	46189	8698	9169
1985	6036	27316	27864	33900
1986	2120	38100	27885	30005
1987	1986	47971	27320	29306
1988	2598	51019	33421	36019
1989	1761	54082	44112	45873
1990	670	54737	38778	39448
1991	2133	78032	24574	26707
1992	3839	88910	31968	35807
1993	2288	74593	31572	33860
1994	539	63161	22242	22781
1995	6	106179	18248	18254
1996	631	116788	15913	16544
1997	275	123824	20551	20826
1998	4889	103734	20092	24981
1999	653	110200	18644	19298
2000	54	109087	16830	16884
2001	27	120548	20210	20237
2002	46	93176	11874	11920
2003	152	102320	9008	9160
2004	96	94628	20685	20781
2005	68	93670	13055	13123
2006	1007	102994	12863	13870
2007	403	81116	30944	31347
2008	31	84650	6448	6479
2009	98	103458	4031	4129
2010	1263	67191	10958	12221
2011	422	80682	3711	4132

Source: NEFSC (SAW 54 Assessment Report)

Table 14 Number of Active Weirs and the Catch per Weir in the New Brunswick, Canada Fishery from 1978-2011

Year	Number of Active Weirs	Catch per Weir (mt)
1978	208	162
1979	210	155
1980	120	92
1981	147	102
1982	159	140
1983	143	88
1984	116	72
1985	156	171
1986	105	262
1987	123	216
1988	191	200
1989	171	255
1990	154	258
1991	143	166
1992	151	212
1993	145	216
1994	129	160
1995	106	172
1996	101	156
1997	102	200
1998	108	181
1999	100	191
2000	77	213
2001	101	199
2002	83	142
2003	78	115
2004	84	245
2005	76	166
2006	89	131
2007	97	311
2008	76	79
2009	38	95
2010	77	139
2011	37	71

Source: NEFSC (SAW 54 Assessment Report)

Table 15 Monthly Weir Landings (mt) for Weirs Located in New Brunswick, 1978-2010

YEAR	MONTH Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Total
1978	3				512	802	5,499	10,275	10,877	4,972	528	132	33,599
1979	535	96			25	1,120	7,321	9,846	4,939	5,985	2,638	74	32,579
1980					36	119	1,755	5,572	2,352	1,016	216		11,066
1981					70	199	4,431	3,911	2,044	2,435	1,686	192	14,968
1982		17			132	30	2,871	7,311	7,681	3,204	849	87	22,181
1983					65	29	299	2,474	5,382	3,945	375		12,568
1984					6	3	230	2,344	2,581	3,045	145		8,353
1985					22	89	4,217	8,450	6,910	4,814	2,078	138	26,718
1986	43				17		2,480	10,114	5,997	6,233	2,564	67	27,516
1987	39	21	6	12	10	168	2,575	10,893	6,711	5,362	703	122	26,621
1988		12	1	90	657	287	5,993	11,975	8,375	8,457	2,343	43	38,235
1989		24		95	37	385	8,315	15,093	10,156	7,258	2,158		43,520
1990					93	20	4,915	14,664	12,207	7,741	168		39,808
1991					57	180	4,649	10,319	6,392	2,028	93		23,717
1992				15	50	774	5,477	10,989	9,597	4,395	684		31,981
1993					14	168	5,561	14,085	8,614	2,406	470	10	31,328
1994				18		55	4,529	10,592	3,805	1,589	30		20,618
1995					15	244	4,517	8,590	3,956	896	10		18,228
1996					19	676	4,819	7,767	1,917	518	65		15,781
1997				8	153	1,017	6,506	7,396	5,316				20,396
1998					560	713	3,832	8,295	5,604	525			19,529
1999					690	805	5,155	9,895	2,469	48			19,063
2000					10	7	2,104	7,533	4,940	1,713	69		16,376
2001					35	478	3,931	8,627	5,514	1,479			20,064
2002					84	20	1,099	6,446	2,878	1,260	20		11,807
2003					257	250	1,423	3,554	3,166	344	10		9,003
2004					21	336	2,694	8,354	8,298	913	3		20,620
2005						213	802	7,145	3,729	740	11		12,639
2006					8	43	1,112	3,731	3,832	2,328	125	462	11,641
2007	182		20	30	84	633	3,241	11,363	7,637	6,567	314	73	30,145
2008						82	1,502	2,479	1,507	389	49	32	6,041
2009					5	239	699	1,111	1,219	330			3,603
2010				6	64	1,912	2,560	3,903	1,933	247	46		10,671
NB Average Catch (t)	160	34	9	34	127	378	3,549	8,033	5,410	2,912	659	119	20,939
NB Minimum Catch (t)	3	12	1	6	5	3	230	1,111	1,219	48	3	10	3,603
NB Maximum Catch (t)	535	96	20	95	690	1,912	8,315	15,093	12,207	8,457	2,638	462	43,520

Source: NEFSC (SAW 54 Assessment Report)

The management uncertainty discussion focuses on Canadian catch (New Brunswick weir fishery) because this catch is quite variable and is the only deduction that the Herring PDT believes is necessary to address management uncertainty at this time. Selection of the buffer to account for uncertainty surrounding the catch in the NB weir fishery is at the discretion of the Council and should be based on recent performance in the fishery and the expected level of effort in the next three years.

Below is some information and approaches for the Herring Committee and Council to consider when specifying a deduction to account for management uncertainty related to the NB weir fishery catch in the upcoming fishing years.

1. Recent Average Catch

The Herring PDT is providing a 3-year, 5-year, and 10-year average catch total from the New Brunswick weir fishery (Table 16). The variable averages may be due to a decrease in effort in the NB weir fishery seen in Table 14.

Table 16 New Brunswick Weir Fishery – Recent Catch Averages

Years – Average	NB Weir Fishery Catch (mt)
3-year average (2009-2011)	6,233
5-year average (2007-2011)	11,218
10-year average (2002-2011)	12,358

Source: NEFSC (SAW 54 Assessment Report)

2. 75th Percentile Approach

Another approach the Herring PDT discussed was on the 75th percentile regarding recent catch distribution of the NB weir fishery. This approach may require a larger deduction for management uncertainty (versus an average across a number of years), but it may better address the variability of the fishery. The 75th percentile approach may be more appropriate to consider if the provisions for returning un-utilized catch from the NB weir fishery to Area 1A could be revisited/revised during the specifications process to allow for more un-utilized catch to be returned late in the fishing year, if appropriate (not just 3,000 mt). The PDT suggests that a percentage-based provision may address this (ex., all un-utilized NB weir catch as of October 15, except for x%, would return to Area 1A on November 1). Available information suggests that very little, if any, activity occurs in the NB weir fishery during November and December, and overall, effort in the fishery (reflected by the number of active weirs) is declining over time (see tables presented previously in this section).

Table 17 provides the projections for 5-year averages, 10-year averages, and 20-year averages based on the 75th percentile of herring catch in the NB weir fishery. The 5 and 10 year averages are fairly similar as opposed to the 20 year average, which coincide with a reduction in effort seen in Table 13 and Table 14.

Table 17 Recent Catch Distribution in the NB Weir Fishery

	5 years	10 years	20 years
Average	10,622	11,872	16,612
Median	6,004	11,181	17,317
75%	10,703	12,409	20,445

Source: NEFSC (SAW 54 Assessment Report)

6.2 STATE WATERS CATCH

The vast majority of the Atlantic herring resource is harvested in Federal waters. Catch by Federal permit holders that occurs in State waters is reported and counted against the sub-ACLs. Catch by state-only permit holders is monitored by the ASMFC and is not large enough to substantially affect management of the Federal fishery and the ability to remain under the sub-ACLs. The majority of Atlantic herring landings from State waters occurred in the State of Maine. Connecticut (14 mt herring) and Maine are the only two states that reported landings of herring from state waters fisheries during 2006. According to ME DMR, 252 mt of Atlantic herring were landed by weirs and stop seines in Maine during the months of June – September 2007, with the majority of landings occurring during June. An additional 25 mt was landed by other gear types in the state of Maine (gillnets, hooks, pound nets) during 2006.

The Council determined to close the directed herring fishery when 95% of the sub-ACL was harvested (or 92% in areas with a research set-aside), establishing a buffer between OFL and ABC, managing a 500 mt set aside for West of Cutler fixed gear fishermen, and the ASMFC's requirement that fixed gear fishermen must report through IVR (and therefore have catch counted against the sub-ACL) reduced any management uncertainty associated with State waters landings to an insignificant amount.

The non-federally permitted commercial landings in Area 1A are primarily from Maine fixed gear fishermen and a small number of seiners. Amendment 1 sets aside 500 mt of Atlantic Herring until November for fixed gear fishermen West of Cutler. The Commission's Amendment 2 to the Interstate FMP for Atlantic Herring requires fishermen East of Cutler to report *weekly* through the federal IVR system. ME DMR require the ME state commercial fixed gear fishermen to be compliant with the federal IVR weekly reporting requirements and regulations as well as reporting monthly to ME DMR. Non-federally permitted landings in Maine were only 178 mt in 2008.

During 2010 and 2011 (2012 is unavailable) Atlantic herring landings from state waters only occurred in the State of Maine. According to ME DMR, 757 mt of Atlantic herring were landed by weirs and stop seines in Maine during the months of June – July 2010, with the majority of landings occurring during June. An additional 176 mt was landed by other gear types in the state of Maine (gillnets, hooks, pound nets) during 2010. There was 23.67 mt of Atlantic herring that were landed by weirs and stop seines in Maine during the months of June and September 2011, with the majority of landings occurring during June. An additional 8 mt was landed by other

gear types in the state of Maine (gillnets, hooks, pound nets) during 2011 (Table 18). Note the substantial decrease in herring landings from 2010 to 2011.

Table 18 2010-2011 Atlantic Herring Landings by Non-Federally-Permitted Vessels

Year	State	Live Pounds	Metric Tons
2010	ME	2,057,901	933.46
2011	ME	70,792	32.11

Source: Provided by ME DMR for non-federally-permitted vessel (mostly purse seine vessels). Maine had the only state landings.

The Herring PDT reviewed state waters catch and agree that no additional deduction for management uncertainty related to state waters catch is necessary at this time.

6.3 DISCARDS (HERRING)

SAW 54 regarded herring discards incorporated from the VTR data provided to them by NMFS. Discard estimates have only been available since 1996 and are generally less than 1% of the landings and do not represent a significant source of mortality. However, this is not considered problematic to the 2013-2015 assessment according to SAW 54.

The Herring PDT agrees that uncertainty related to estimating Atlantic herring discards is not likely to be a significant source of management uncertainty to address for the 2013-2015 fishery specifications. This is because increased observer coverage, combined with improved observer sampling in the herring fishery, has improved bycatch accounting and reduced uncertainty associated with estimating herring discards in recent years (see additional information presented below). Moreover, management measures implemented through Amendment 5 will likely improve catch monitoring and the accuracy of herring discard estimates in future years.

6.3.1 Background: 2010-2012 Fishery Specifications

During the development of the 2010-2012 herring fishery specifications, the Herring Committee reviewed all available information regarding discards of Atlantic herring in the herring fishery and determined that no additional reduction was necessary to account for uncertainty related to herring discards for the 2010-2012 years. Available information suggested that Atlantic herring discards in the herring fishery appeared to be very low and largely insignificant relative to the landings in the fishery and the ability to prevent the sub-ACLs from being exceeded. Even without an additional deduction to account for discards as part of management uncertainty, it is likely that herring discards would be accounted for within the additional 5% of the sub-ACL that remains available for incidental catch once the directed fishery in a management area closes allowing for an adequate buffer for un-documented discards.

- All three sources of herring discard information considered by the Herring PDT and Committee (observer data, VTR, and IVR) are generally consistent with each other and suggest that discard rates of Atlantic herring in the herring fishery are very low.

- Any further deductions for discarding to account for management uncertainty would need to reflect concerns that discards of herring may increase above the levels that have been observed in recent years for the fishery, or concerns that discards are not being adequately documented through the current observer program and self-reporting.

Table 19 summarizes Atlantic herring discard rates based on observer data for the fishery from 2007-2009 (all trips with 2,000 pounds or more Atlantic herring, 2009 data were complete through April 2009 when the specifications were developed). Discard rates are presented as discard/kept ratios per 1,000 pounds of herring kept. Herring discard rates for the fishery are very low, especially considering the high-volume nature of the fishery. In 2008, when observer coverage was highest (close to 15% of all trips with 2,000 pounds or more herring), the observed discard rate was about 10 pounds of herring per 1,000 pounds kept, i.e., one percent (1%). Observed herring discard rates in 2007 and 2009 were less than 0.5%.

Table 19 Summary Table – Observed Atlantic Herring Discard Rates, 2007-2009

	2007	**2008**	**2009 (through April)**
% Coverage (Obs. Trips/Total Trips)	4.3%	14.6%	13.3%
Pounds Herring Discarded	51,625.3	372,232.3	58,983.2
Pounds Herring Kept	11,181,344	36,441,910	13,511,884
D/K Ratio (per 1,000 lbs. herring kept)	4.62	10.21	4.37

Source: NEFSC Observer Program

6.3.2 Discard Estimates from NMFS/NERO Year-End Totals

Discards of Atlantic herring by area were determined using the following formula, where NK = herring unknown (refer to section 6.3.6):

(Observed Atlantic Herring NK/Observed Kept All Species) x (Vessel Kept All Species)

Only discard and kept all data from observed hauls were used in calculating the discard ratio. Discard ratios were determined for each area and gear type, and then multiplied by vessel kept all by area and gear type. Where vessel kept all area and gear type were missing on VTR's, observer ratios were multiplied by the weighted average of the discard ratios for all observed gear types by corresponding area. Estimated discards for all gear types were then summed by area resulting in a fleet-wide estimate of discards for Atlantic herring (provided by NMFS). Table 20 shows that the "Discards as % of Total Catch" were minimal in 2010 and 2011.

Table 20 Atlantic Herring Discard Estimates in 2010 and 2011

Year	Management Area	Total herring catch (mt)	Discarded herring (mt)	Discards as % of Total Catch
2010	1A	28,424	60	0.21
2010	1B	6,001	3	0.05
2010	2	20,831	50	0.24
2010	3	17,596	23	0.13
Total		72,852	136	0.19
2011	1A	30,676	55	0.18
2011	1B	3,530	2	0.06
2011	2	15,001	81	0.54
2011	3	37,038	71	0.19
Total		86,245	209	0.24

Source: NMFS year-end totals.
**The 2011 catch totals are preliminary and pending rulemaking.*

6.3.3 2010 Herring PDT Discard Estimate from Amendment 5 Draft EIS

As part of the analyses required to develop alternatives for allocating observer coverage, the Herring PDT used 2010 observer data for limited access herring vessels to generate fleet-wide estimates of herring discards. These data were analyzed with formulae similar to those specified by the SBRM amendment to calculate variance and to estimate the number of trips necessary to achieve certain levels of precision over a range of desired CVs. This analysis helped to better illustrate the trade-offs associated with the choices that would need to be made in Amendment 5, based on goals and priorities for observer coverage as well as available resources.

Overall, the Herring PDT concluded that discards of Atlantic herring are low; approximately 360,000 lbs. in 2010, estimated in the PDT analysis, or 0.25% of the Atlantic herring catch (Table 21). In addition, there was a low amount of variability; CVs fishery-wide were 20%.

Table 21 Estimated Removals, Proportion of Total Removals, and CV by Strata for Atlantic Herring (2010)

Estimate (lbs.)

Area	BT	PS	MWT	Total
CC/GB	0		67,591	67,591
GOM	0	46,625	91,189	137,814
SNE	47,150	0	114,638	161,788
Total	47,150	46,625	273,419	367,194

Proportion of total removal

Area	BT	PS	MWT	Total
CC/GB			0.18	0.18
GOM	0.00	0.13	0.25	0.38
SNE	0.13		0.31	0.44
Total	0.13	0.13	0.74	1.00

CV

Area	BT	PS	MWT
CC/GB			0.24
GOM		0.33	0.38
SNE	0.82		0.40

Source: Herring PDT Analysis of Alternatives to Allocate Observer Coverage on Limited Access Herring Vessels, Amendment 5 DEIS.

6.3.4 Summary of Herring Discards in 2010 and 2011 from NEFOP Observers

The following information seen in Table 22, Table 23, and Table 24 was provided by NEFOP staff on the Herring PDT and updates some information provided in the Amendment 5 Draft EIS.

Table 22 summarizes coverage rates from the NEFOP for the 2009-2011 calendar years (also the herring fishing years) by gear type for all trips that landed greater than 2,000 pounds of Atlantic herring. During the 2011 fishing year, NEFOP covered trips for about 55% of all midwater trawl, 45% of pair trawl, 25% of purse seine, and 13% of bottom-trawl Atlantic herring landings.

Observer coverage of mackerel catch has generally been less in recent years, partially because the observer program used to select away from trips that target mackerel but still notified for herring (this was due to coverage needs for herring related to groundfish).

Table 22 Observer Program Coverage Rates for Trips Landing Greater than 2,000 pounds of Herring, 2009-2011

Year	Gear Type	Total Trips	Total Days	Total Herring Landed (lbs.)	Obs Trips	Obs Days	Obs Herring Kept (lbs.)	% trips obs	% days obs	% herring obs
2009	OTF	180	306	9,647,215	11	15	554,579	6%	5%	6%
2009	OTM	50	242	13,875,075	16	69	3,747,316	32%	29%	27%
2009	PTM	356	1321	153,345,903	98	350	49,596,367	28%	26%	32%
2009	PUR	223	596	49,706,514	42	130	9,943,521	19%	22%	20%
2010	OTF	185	343	8,452,546	9	22	298,691	5%	6%	4%
2010	OTM	58	230	19,851,018	32	122	10,190,452	55%	53%	51%
2010	PTM	290	1129	98,165,321	128	545	47,528,352	44%	48%	48%
2010	PUR	222	506	18,799,340	24	58	1,850,818	11%	11%	10%
2011	OTF	175	368	9,449,163	24	59	1,208,293	14%	16%	13%
2011	OTM	61	165	17,647,500	27	91	9,758,411	44%	55%	55%
2011	PTM	295	1071	115,321,409	123	452	51,562,629	42%	42%	45%
2011	PUR	271	603	37,908,770	79	172	9,506,794	29%	29%	25%

OTF – small mesh bottom trawl; OTM – single midwater trawl; PTM – paired midwater trawl; PUR – purse seine
Herring is Atl Herring or Unk Herring;
Day defined as (date land - date sail) + 1;
Landings data from Vessel Trip Reports
Source: NEFSC Observer Program

6.3.5 Slippage Information for 2010 and 2011 (Updated from Amendment 5 DEIS)

In 2010, observer coverage for the midwater trawl fleet was about 30% fishery-wide and substantially higher on Georges Bank (85% coverage by weight of fish landed). Overall, observers provided data for 929 hauls on limited access herring vessels during the 2010 fishing year. The new discard log allows observers to provide more information about reasons for not bringing fish on board, including who estimated the released catch, additional details regarding why the catch was released, and whether the discards were observed on the deck or in the water. Additional information from the 2010 discard log should be available by the end of 2012 and will be added to the final Amendment 5 EIS document.

Table 23 summarizes data from 332 NEFOP records (287 unique hauls) in 2010 that included "fish not brought on board" on limited access declared herring trips. About 290 of these hauls were documented with "not enough fish to pump," i.e., operational discards. NEFOP observers document operational discards as *Herring NK* if they are able to see the fish that are not pumped and confirm that the discards are all herring-bodied fish. Otherwise, the discards are documented as *Fish NK* (see below for more information about the evolution of the *Herring NK* and *Fish NK* categories). The total weight of "fish not brought on board" estimated by NEFOP in 2010 was about 460,000 pounds; this includes operational discards, which, although more frequent,

generally represent very small amounts of fish. Total herring landings for this fleet in 2010 were about 58 million pounds.

A preliminary review of NEFOP data indicate that in 2010, only 35 records (approximately 30 unique hauls) of 929 observed hauls (3.2%) on limited access herring vessels were documented to have experienced full or partial slippage events. The total estimated catch not brought on board compared to the total observed catch on these vessels in 2010 was about 0.7% (this does not include fish that were brought on board and then discarded). In addition, there were 99 hauls observed in Closed Area I during 2010, under the new provisions for sampling catch, implemented in November 2009. There were no slippage events observed in these 99 hauls, and consequently no Released Catch Affidavits were submitted from the Closed Area I fishery in 2010. There appears to have been one released catch event (estimated 1,500 pounds) on a haul that ended (but did not begin) in Closed Area I. However, the recently-implemented revisions to the Closed Area I rules (January 2011) require that all operational discards be brought on board.

Table 23 Summary of 2010 Observed Events on Limited Access Herring Vessels (by Number and Estimated Weight of Fish in Lbs.) with Fish Not Brought on Board

	species	"reason not specified"	"gear damage"	"fell out of gear"	"no market value"	"vessel capacity filled"	"not enough fish to pump"
Number of hauls with occurrence	butterfish	1					1
	haddock						6
	herring nk			3		1	105
	atl herring	1				1	18
	mackerel	1				1	4
	redfish						7
	spiny dogfish						1
	striped bass			1			1
	whiting	1					4
	fish nk	10	5	3	2	3	138
	hake nk						6
	lobster						1
	Loligo	1					1
	Illex						2
	eel nk						2
Estimated weight (lbs)	butterfish	5					1
	haddock						72
	herring nk			410		3,000	20,622
	atl herring	100				175	6,425
	mackerel	50				175	155
	redfish						38
	spiny dogfish						25
	striped bass			12			10
	whiting	10					372
	fish nk	169,450	108,000	4,700	44,000	20,050	72,766
	hake nk						215
	lobster						10
	Loligo	3					10
	Illex						13
	eel nk						8,150

Source: NEFSC Observer Program

Table 24 summarizes data for the observer records (1140 unique hauls) in 2011 on limited access declared herring trips that included fish not brought on board. About 198 of these hauls were documented with "not enough fish to pump," i.e., operational discards. Observers document operational discards as *Herring NK* if they are able to see the fish that are not pumped and confirm that the discards are all herring-bodied fish. Otherwise, the discards are documented as *Fish NK*. Data were pulled similar to the 2010 released catch/slippage data provided in the Draft Amendment 5 EIS (see Section 5.3.2.1, p. 413 of Amendment 5 DEIS for comparable 2010 data).

The total NEFOP estimated weight of fish not brought on board in 2011 was 1,041,211 pounds; this includes operational discards, which, although more frequent, generally represent very small amounts of fish.

A review of NEFOP data indicate that in 2011, 78 out of 1,140 hauls were observed on limited access declared herring trips to have experienced full or partial slippage events (catch not brought on board, not including operational discards). The ratio of total estimated catch not brought on board compared to the total observed catch on these vessels in 2011 was about 1.4% (this does not include fish that were brought on board and then discarded). By gear type, this ratio translates to 0.16% for bottom otter trawl (all areas), 5.31% for purse seine (Area 1A), 2.19% single midwater trawl (all areas), 0.11% pair trawl (Area 1A), 0.53% pair trawl (Area 3), and 0.48% pair trawl (Area 2).

Table 24 Summary of 2011 Observed Events on Limited Access Herring Vessels – Declared Herring Trips (by Number and Estimated Weight of Fish in lbs.) with "Fish Not Brought on Board" Codes

	species	"reason not specified"	"gear damage"	"fell out of gear"	"no market value"	"vessel capacity filled"	"not enough fish to pump" (operational discards)
Number of hauls with occurrence	atl herring	5	0	1	1	1	23
	dogfish	0	0	0	0	0	1
	eel nk	0	0	0	0	0	4
	fish nk	27	6	0	5	12	54
	herring nk	7	1	4	1	6	116
	Illex	1	0	0	0	0	3
	redfish	0	0	0	1	0	0
	shrimp nk	0	0	0	0	0	1
	squid nk	1	0	0	0	0	2
Estimated weight (lbs)	atl herring	2,754	0	10	10,000	500	1,947
	dogfish	0	0	0	0	0	80
	eel nk	0	0	0	0	0	860
	fish nk	339,170	394,000	0	68,400	108,500	11,398
	herring nk	43,700	300	170	10,000	32,700	16,248
	Illex	3	0	0	0	0	30
	redfish	0	0	0	400	0	0
	shrimp nk	0	0	0	0	0	1
	squid nk	10	0	0	0	0	30

Note: Information in all columns except for the far right ("not enough fish to pump" (operational discards)) represents partial/full slippage events.
Source: NEFSC Observer Program

6.3.6 Use of "Herring NK" and "Fish NK"

In reference to Amendment 5, it is important to understand the use of the *Fish NK* and *Herring NK* categories in NEFOP data and the ongoing effort by NEFOP to reduce these categories and better document all fish either kept, discarded, transferred, or not brought on board in the limited access herring fishery. In 2009, NEFOP transitioned to the use of *Fish NK* to represent the component of the catch for which observers could not verify identification. This includes partial and fully released tows and operational discards. Prior to 2009, *Fish NK*, *Herring NK*, or *Atlantic herring* were used to describe this component of the catch, depending upon observer's visual inspection and/or captain and crew input.

In 2009, NEFOP also transitioned to the use of *Fish NK* to represent the composition of the catch pumped to the paired vessel when an observer is not present on the boat taking on the fish. Prior to 2009, *Atlantic herring*, *Herring NK*, or *Fish NK* were used to represent this component of the catch, based on the observers assumption that partial catches being pumped to the vessel they were deployed on, were made up of the similar species composition of that being pumped to the alternate vessel. The 2009 and 2010 protocols for the use of *Fish NK* and *Herring NK* were consistent. Using the most recent data as an example (Table 25), the majority of *Fish NK* records in 2010 (54%) were associated with fish that were pumped to the paired vessel without an observer present to sub-sample. These fish were landed, sold, and documented through dealer and VTR data (along with IVR at the time), and the landings may have been sampled through a State portside sampling program.

In 2010, *Herring NK* was documented on 122 hauls, and *Fish NK* was documented on 200 hauls. The majority of *Herring NK* (86%) was due to "not enough fish to pump" (operational discards). Sixty nine percent (69%) of *Fish NK* was associated with operational discards. In general, the amounts of fish classified in these categories per haul are relatively small. There was one sampling event in 2010 that documented 30,000 pounds of *Herring NK* "kept," which represents almost half of all *Herring NK* observed in 2010 (Table 25). In this one event, the observer was able to see the fish as they came on board, and during the pumping process, the observer could confirm that the fish were all herring-bodied fish but could not obtain basket samples for safety reasons. About ½ of observed *Fish NK* and *Herring NK* in 2010 was landed; in these cases, portside sampling would be beneficial to confirm the species composition of the landings.

The remaining *Fish NK* records are mostly associated with fish that were discarded and the reason was not specified, fish that were discarded due to gear damage and operational discards. Operational discards that the observer is able to visually inspect and therefore term *Herring NK* instead of *Fish NK*, represent 36% of the herring NK records. Nine percent (9%) of the *Herring NK* records are associated with fish that mainly fell from the chute, were seen by the observer and therefore identified as herring, then washed overboard. Species identification issues also result in the use of *Fish NK* or *Herring NK*. In these cases, observers send in a whole fish sample, to be identified by experienced staff at NEFOP. If the observer mis-identified the species, the use of *Fish NK* or *Herring NK* may be used. In 2010, one record was changed to *Herring NK* due to mis-identification of the species.

Table 25 Quantification of Fish NK and Herring NK (in Pounds) on Observed Hauls by Limited Access Herring Vessels in 2010

	species group	"kept"	"kept, transferred to other vessel"	"discarded, other"	"discarded, poor quality, gear damage"	"discarded no market, too small"	"discarded no market, reason not specified"	"not brought onboard reason not specified"	"not brought onboard gear damage"	"not brought onboard fell out of gear"	"not brought onboard no market value"	"not brought onboard vessel capacity filled"	"not brought onboard not enough fish to pump"	TOTALS
Number of hauls with occurrence	herring nk	2	0	10	0	1	1	0	0	3	0	0	105	**122**
		1.6%	0 %	8.2%	0%	0.8%	0.8%	0 %	0 %	2.5%	0 %	0 %	86.1%	
	fish nk	6	11	14	1	0	5	10	5	3	3	4	138	**200**
		3%	5.5%	7%	0.5%	0%	2.5%	5%	2.5%	1.5%	1.5%	2 %	69 %	
	Total													**322**
Observed Pounds	herring nk	30,004	0	5,620	0	100	150	0	0	410	0	0	20,622	**56,906**
		52.73%	0 %	9.9%	0 %	0.2%	0.3%	0 %	0 %	0.7%	0 %	0 %	36.2%	
	fish nk	110	692,240	67,065	20	0	90,430	169,450	108,000	4,700	52,000	23,050	72,766	**1,279,831**
		0.01%	54.1%	5.2%	0 %	0 %	7.1%	13.2%	8.4%	0.4%	4.1%	1.8%	5.7%	
	Total													**1,336,737**

Source: NEFSC Observer Program

7.0 SPECIFICATION OF DAH, DAP, AND BT

The Herring FMP specifies that domestic annual harvest (DAH) will be set less than or equal to OY and will be composed of domestic annual processing (DAP), the total amount allocated to processing by foreign ships joint-venture processing (JVP), and the amount of herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada (BT).

7.1 DOMESTIC ANNUAL HARVEST (DAH)

For 2010-2012, DAH was set to equal OY for the U.S. Atlantic herring fishery. Domestic annual harvest (DAH) is established based on the expected catch from U.S. fishing vessels during the upcoming fishing year. The Herring FMP specifies that OY is equal to DAH plus a reserve.

OY = DAH

When specifying DAH for the herring fishery, important considerations relate to the actual and potential capacity of the U.S. harvesting fleet. Recent fishery performance (landings) is also an important factor in this fishery, which has consistently under-utilized the total available OY. The Herring FMP became effective during the 2001 fishing year, and since 2001, total landings in the U.S. fishery have decreased.

7.2 DOMESTIC ANNUAL PROCESSING (DAP)

DAP was set equal DAH minus 4,000 mt for BT during the 2010-2012 fishing years (87,200 mt).

Domestic Annual Processing (DAP) is defined in the Herring FMP as the amount of U.S. harvest that domestic processors will use, combined with the amount of the resource that will be sold as fresh fish (including bait). The Herring FMP specifies that DAP is a subset of DAH and is composed of estimates of production from U.S. shoreside and at-sea processors.

Processing, with respect to the Atlantic herring fishery, is defined in the regulations as *the preparation of Atlantic herring to render it suitable for human consumption, bait, commercial uses, industrial uses, or long-term storage, including but not limited to cooking, canning, roe extraction, smoking, salting, drying, freezing, or rendering into meat or oil.* The definition of processing does not include trucking and/or transporting fish.

In recent years, the domestic processing sector of the herring fishery has utilized more than the proposed DAP specification for 2010-2012.

7.3 BORDER TRANSFER (BT)

U.S.-caught herring transferred to Canadian vessels for export.

Specification of BT has remained at 4,000 mt since the implementation of the Herring FMP, and there was no change for the 2010-2012 fishing years. Table 26 indicates a decrease in BT from 1994-2011, with 2011 utilizing 946 mt (24% of 4,000 border transfer mt).

Table 26 Utilization of Border Transfer (mt)

YEAR	MT Utilized in BT
1994	2,456
1995	2,117
1996	3,690
1997	1,280
1998	1,093
1999	839
2000	1,546
2001	445
2002	688
2003	1,311
2004	184
2005	169
2006	653
2007	53
2008	0
2009	XXX
2010	XXX
2011	946

**Source: 2010-2012 specifications, NMFS*

8.0 MANAGEMENT AREA SUB-ACLS

Overview

Sub-ACLs (formerly known as Total Allowable Catches (TAC)) for each of the four herring management areas are categorized as 1A, 1B, 2, and 3 (represented in Figure 1). Set-asides for research and fixed gear fisheries in Area 1A are also specified as necessary. The Council uses the best information available to estimate the proportion of each spawning component of the Atlantic herring stock complex in each area/season and distributes the sub-ACLs such that the risk of overfishing an individual spawning component is minimized to the extent possible based on the options under consideration. The purpose of this action is to establish specifications for the Atlantic herring fishery during the 2013-2015 fishing years.

Primary analysis focuses on the impacts of the proposed sub-ACL distributions on the individual spawning components of the herring stock complex, with particular attention to the inshore (Gulf of Maine) spawning component. The inshore component is considered to be the smaller stock component and is the focus of more fishing effort and recent concerns related to localized depletion (see Amendment 1 for more discussion). Therefore, the inshore component can be characterized, for the purposes of analysis, as the "limiting factor" in terms of allocating herring sub-ACLs to management areas such that the risk of overfishing individual stock components can be minimized. Canadian catch in the NB weir fishery also is considered in this analysis, as that catch is assumed to come entirely from the inshore component of the Atlantic herring stock complex.

8.1 OPTIONS FOR MANAGEMENT AREA SUB-ACLS

TBD by Herring Committee/Section Meeting September 20, 2012.

8.2 RESEARCH SET-ASIDE (RSA)

There is a research set-aside established in Amendment 1 (0-3% for any management area) and a corresponding requirement that when the catch in a management area is projected to reach 92% of its specified sub-ACL (or whatever the appropriate percentage is, based on the RSA), the Regional Administrator closes the area to all directed herring fishing. However, there was no RSA set for the 2010-2012 specifications, consequently the Regional Administrator closed the area to all directed herring fishing at 95% of its specified sub-ACL.

The RSA process is a competitive grants process administered by the Northeast Fisheries Science Center. Proposals are requested for research, and incoming proposals are reviewed and ranked by a technical body. With competitive grants awarded through this process, different entities will apply. For catch monitoring, it is important to ensure that only qualified entities apply, and it would be difficult to ensure a consistent monitoring program with multiple entities potentially competing for the available funds in any given year.

8.3 FIXED GEAR SET-ASIDE (FGSA)

The FGSA was set to 295 mt for the 2010-2012 specifications in Area 1A. Amendment 1 sets aside up to 500 metric tons of Atlantic Herring until November 1 for fixed gear fishermen West of Cutler. The Commission's Amendment 2 to the Interstate FMP for Atlantic Herring requires fishermen East of Cutler to report weekly through the federal IVR system. ME DMR require the ME state commercial fixed gear fishermen to be compliant with the federal IVR weekly reporting requirements and regulations as well as reporting monthly to ME DMR.

9.0 LIST OF ACRONYMS

ACL	Annual Catch Limit
AM	Accountability Measure
ASMFC	Atlantic States Marine Fisheries Commission or Commission
B	Biomass
BH	Beverton-Holt Stock-Recruitment Curve
BT	Border Transfer
CAA	Catch at Age
CHOIR	Coalition for the Atlantic Herring Fishery's Orderly, Informed, and Responsible Long-Term Development
CZMA	Coastal Zone Management Act
DAH	Domestic Annual Harvest
DAP	Domestic Annual Processing
DMF	Division of Marine Fisheries
DMR	Department of Marine Resources
DSEIS	Draft Supplemental Environmental Impact Statement
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
E.O.	Executive Order
ESA	Endangered Species Act of 1973
F	Fishing Mortality Rate
FEIS	Final Environmental Impact Statement
FGSA	Fixed Gear Set-Aside
FMP	Fishery Management Plan
FSEIS	Final Supplemental Environmental Impact Statement
FY	Fishing Year
GB	Georges Bank
GMRI	Gulf of Maine Research Institute
GOM	Gulf of Maine
IRFA	Initial Regulatory Flexibility Analysis
IOY	Initial Optimal Yield
IVR	Interactive Voice Response
IWP	Internal Waters Processing
JVP	Joint Venture Processing
M	Natural Mortality Rate
MA DMF	Massachusetts Division of Marine Fisheries

MAFMC	Mid-Atlantic Fishery Management Council
ME DMR	Maine Department of Marine Resources
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistical Survey
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSRA	Magnuson-Stevens Reauthorization Act
MSY	Maximum Sustainable Yield
mt	Metric Tons
NB	New Brunswick
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NSGs	National Standard Guidelines
OFL	Overfishing Limit
OY	Optimum Yield
PDT	Plan Development Team
PS/FG	Purse Seine/Fixed Gear
RFA	Regulatory Flexibility Act
RFFA	Reasonably Foreseeable Future Action
RIR	Regulatory Impact Review
SARC	Stock Assessment Review Committee
SAW	Stock Assessment Workshop
SSB	Spawning Stock Biomass
SSC	Scientific and Statistical Committee
SFA	Sustainable Fisheries Act
TAC	Total Allowable Catch
TALFF	Total Allowable Level of Foreign Fishing
TC	Technical Committee
TRAC	Transboundary Resource Assessment Committee
TRT	Take Reduction Team
USAP	U.S. At-Sea Processing
VMS	Vessel Monitoring System
VTR	Vessel Trip Report