NEW ENGLAND FISHERY MANAGEMENT COUNCIL

DRAFT Herring Plan Development Team (PDT) Report

May 13, 2015

GARFO Office, Gloucester, MA

The Herring Plan Development Team (PDT) met on May 13, 2015 to: review/discuss the Atlantic herring operational assessment results and develop related recommendations for the May 20, 2015 Scientific and Statistical Committee (SSC) Meeting; review/discuss updated catch information to develop river herring/shad (RH/S) catch cap options in 2016-2018 Atlantic herring specifications package; review/discuss Amendment 8 scoping comments (Atlantic herring ABC control rule); and to discuss the further development of information and analyses for the 2016-2018 Atlantic herring specifications package. The majority of the Herring PDT meeting was focused on the Atlantic herring operational assessment and the development of related information/recommendations for the May 20, 2015 SSC Meeting.

Meeting Attendance: Lori Steele (Herring PDT Chairman), Rachel Feeney (NEFMC Staff); Matt Cieri (ME DMR); Micah Dean (MA DMF); Renee Zobel (NHFG); Jon Deroba (NEFSC); Madeline Hall-Arber (MIT Sea Grant); Brant McAfee, Tim Cardiasmenos, and Carrie Nordeen (GARFO); Sara Weeks (NEFOP) (Herring PDT Members); *Audience:* Judd Crawford, Gregg Wells.

Webinar: Min-Yang Lee (NEFSC); Toni Kerns (ASMFC); Brad Schondelmeier (MA DMF).

KEY OUTCOMES

- The Herring PDT discussed the major sources of uncertainty from the Atlantic herring update assessment (April 2015) and developed additional information and projections for the SSC to consider when it develops recommendations for acceptable biological catch (ABC) for the 2016-2018 Atlantic herring fishery specifications.

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1.0 ATLANTIC HERRING OPERATIONAL STOCK ASSESSMENT (UPDATE)

Dr. Deroba presented an overview of the Atlantic herring operational (update) assessment meeting, held in Woods Hole, MA on April 8-9, 2015. The serves as an update to the SAW/SARC 54 benchmark assessment conducted in 2012. The Herring PDT generally discussed the operational assessment results and sources of uncertainty, and several PDT members asked clarifying questions.

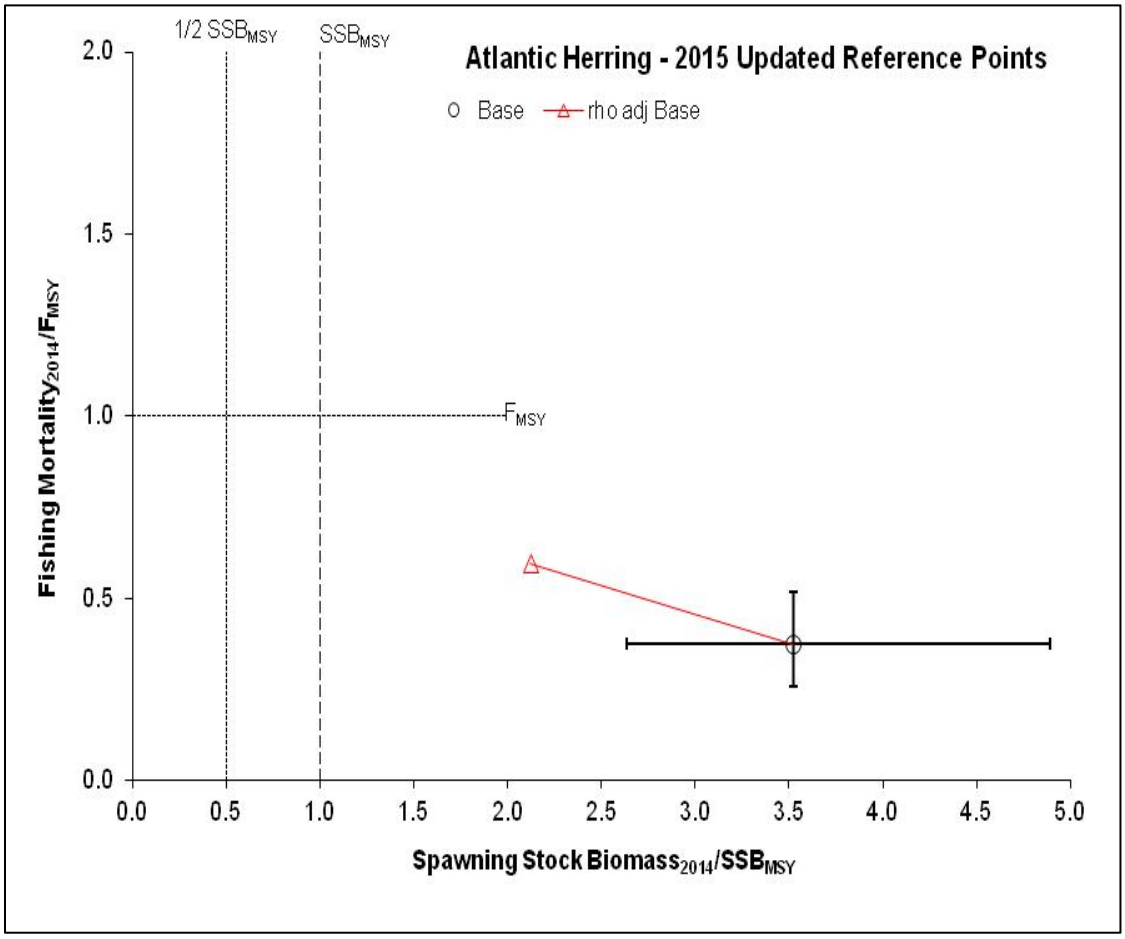
1.1 ATLANTIC HERRING STOCK STATUS

Overall, the updated assessment indicates that the Atlantic herring resource continues to remain well above its biomass target (rebuilt), and fishing mortality remains well below the F_{MSY} threshold (not overfishing). A retrospective pattern re-emerged when updating the assessment model, which suggests that Atlantic herring spawning stock biomass (SSB) is likely to be overestimated and fishing mortality (F) is likely to be underestimated in the terminal year of the assessment. Resolution of a technical error in the contribution of recruitment to the objective function (i.e., negative log-likelihood) of the assessment model also affected the severity of the retrospective pattern. As a result, the assessment review panel applied a retrospective adjustment to the SSB and F values for the terminal year (2014) using Mohn's Rho. The retrospective adjustments resulted in approximately a 40% decrease in the terminal year (2014) SSB estimate and a 60% increase in the 2014 F estimate. Even with the retrospective adjustments, the Atlantic herring stock complex remains above the biomass target and below the fishing mortality threshold (Table 1, Figure 1).

Table 1 Summary of Atlantic Herring Reference Points and Terminal Year SSB/F Estimates from Benchmark Assessment (2012) and Update Assessment (2015)

	2012 SAW 54 Benchmark	2015 Update (Non-Adjusted)	2015 Update (Retro-Adjusted)
Terminal Year SSB	518,000 mt (2011)	1,041,500 mt (2014)	**622,991 mt (2014)**
Terminal Year F	0.14 (2011)	0.10 (2014)	**0.16 (2014)**
SSB_{MSY}	157,000 mt	311,145 mt	
F_{MSY}	0.27	0.24	
MSY	53,000 mt	77,247 mt	

Figure 1 Atlantic Herring Operational Assessment: 2014 Fishing Mortality and SSB Relative to F_{MSY} and SSB_{MSY} Reference Points, Including Retrospective Adjustment (Red Line)



Note: Error bars represent 10th and 90th percentiles of 2014 F/SSB estimates.

1.2 ASSESSMENT UNCERTAINTY

In general, Herring PDT members felt that the assessment uncertainty is greater now than after the Atlantic herring benchmark stock assessment in 2012. The PDT discussed the re-emerging retrospective pattern, assumptions about M, and the mis-match between implied consumption and estimated consumption as the primary sources of uncertainty in the Atlantic herring update assessment (see following subsections).

The size/strength of the 2011 year class and other sources of uncertainty were also identified in the assessment report. The Herring PDT noted that signals related to the 2011 year class (possibly the second-largest on record) are similar to those for the 2008 year class that were noted in the 2012 benchmark assessment. The update assessment indicates that the 2008 year class has persisted through the fishery as the strongest on record.

1.2.1 Retrospective Pattern

Since the benchmark assessment, an issue with the contribution of recruitment to the negative log likelihood in the assessment framework, ASAP, was discovered. This issue was resolved for the operational assessment. Differences in results and diagnostics between the benchmark and the update are partially attributable to the likelihood issue. Resolving the likelihood issue had the effect of changing the scale of estimates (e.g., increasing abundance estimates), particularly in recent years. Regardless of the likelihood issue, diagnostic problems (e.g., retrospective patterns) were present in the update assessment. Resolving the likelihood issue only amplified these diagnostic problems (e.g., worsening retrospective patterns). To account for retrospective bias, the assessment review panel made a significant retrospective adjustment to the terminal year (2014) estimates of SSB (40%) and F (60%). The retrospective-adjusted estimates of SSB and F are utilized for the short-term (2016-2018) catch projections (see Section 1.4 for catch projections). The Herring PDT notes that no retrospective adjustment was applied to the benchmark terminal year (2011) biomass and fishing mortality estimates that were used in the projections for the 2013-2015 fishery specifications.

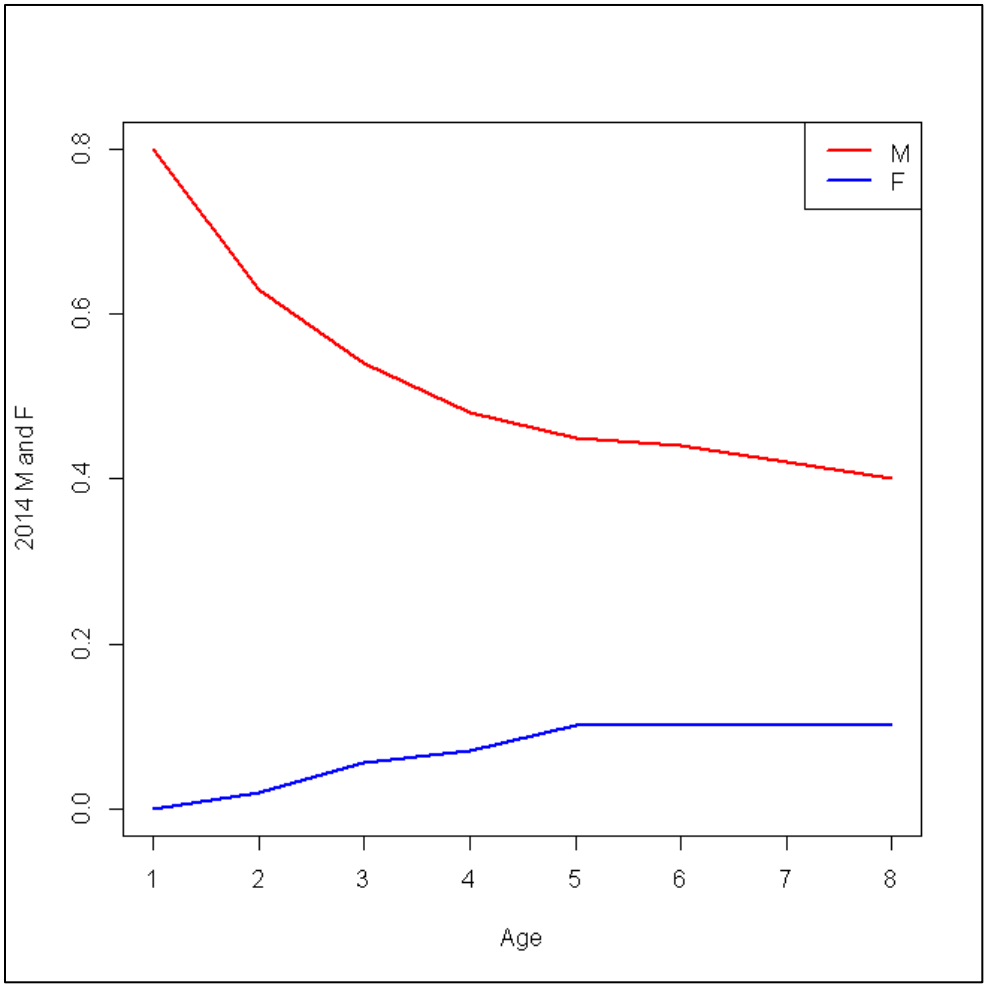
The PDT considered whether or not a retrospective adjustment should be considered sufficient to address additional uncertainties identified by the operational assessment review panel and agreed that the answer relates to the SSC's and Council's comfort with the retrospective adjustment and overall risk tolerance. The re-emergence of the retrospective pattern suggests a fundamental diagnostic problem with the assessment model that remains a cause for concern. However, it appears that the stock would remain above the biomass target and below the fishing mortality thresholds even if the 90%/10% confidence intervals associated with the terminal year estimates of F and SSB (see Figure 1 on p. 3) are applied to the retrospective-adjusted estimates to account for variability/uncertainty in those estimates beyond the retrospective bias (i.e., stock status would not change, 2014 F would remain below the threshold, and 2014 SSB would remain above the target).

1.2.2 Natural Mortality (M) and Consumption

The Herring PDT discussed uncertainty associated with the treatment of natural mortality (M) in the assessment model and the divergence between NMFS' consumption estimates (based on stomach content data) and levels of consumption implied by the input M values in the assessment model. The mismatch between estimated and implied consumption became apparent when the assessment model was updated. Overall, PDT members were not significantly concerned about this mismatch because of the possible inaccuracy of consumption estimates derived from the food habits data. The PDT noted that these data can be extremely sensitive to presence/absence of herring in just a few stomach samples. While food habits data are used to estimate consumption by teleost predators (fish), estimates of consumption by marine mammals, seabirds, and some larger predators (ex. tuna) are derived from prior research and assumed to be constant in recent year; these data may not be complete. Moreover, consumption of herring and other species may change due to factors other than M (e.g., herring abundance, spatial overlap).

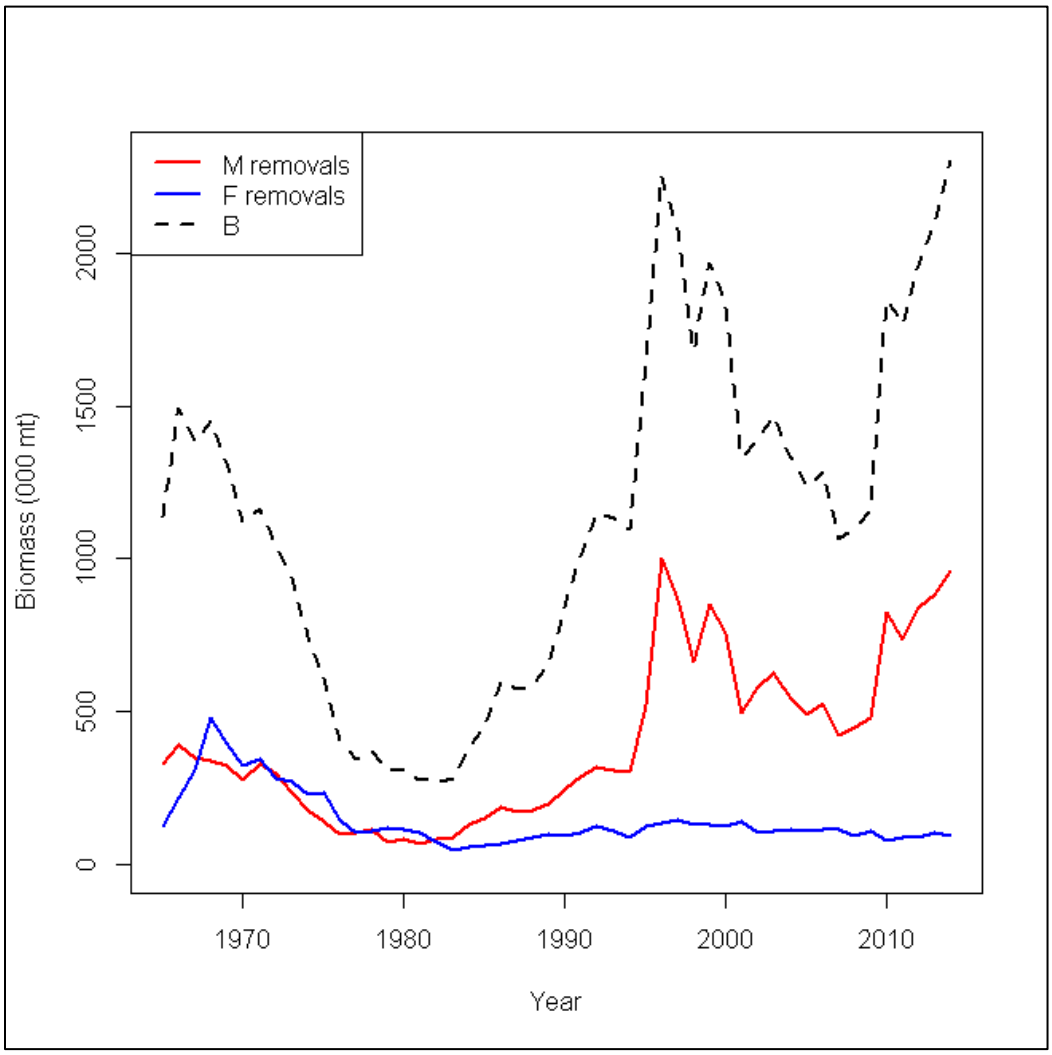
The assessment model assumes a significant amount of natural mortality on Atlantic herring, particularly at younger ages, before the fish experience mortality from the fishery. Figure 2 shows how the assessment model treats natural mortality (red line) and fishing mortality (blue line) by age class in 2014. Thus, the model assumes that M is a much higher fraction of total mortality than fishing mortality. Figure 3 illustrates removals from fishing mortality and natural mortality estimated from the assessment model relative to total biomass over the entire time series.

Figure 2 Atlantic Herring Operational Assessment: 2014 Estimated Natural Mortality (M) and Fishing Mortality (F) by Age



Source: Atlantic Herring Operational Assessment Meeting, April 8-9, 2015.

Figure 3 Atlantic Herring Operational Assessment: Estimated Removals from Natural Mortality (M) and Fishing Mortality (F) Relative to Total Estimated Biomass (B)

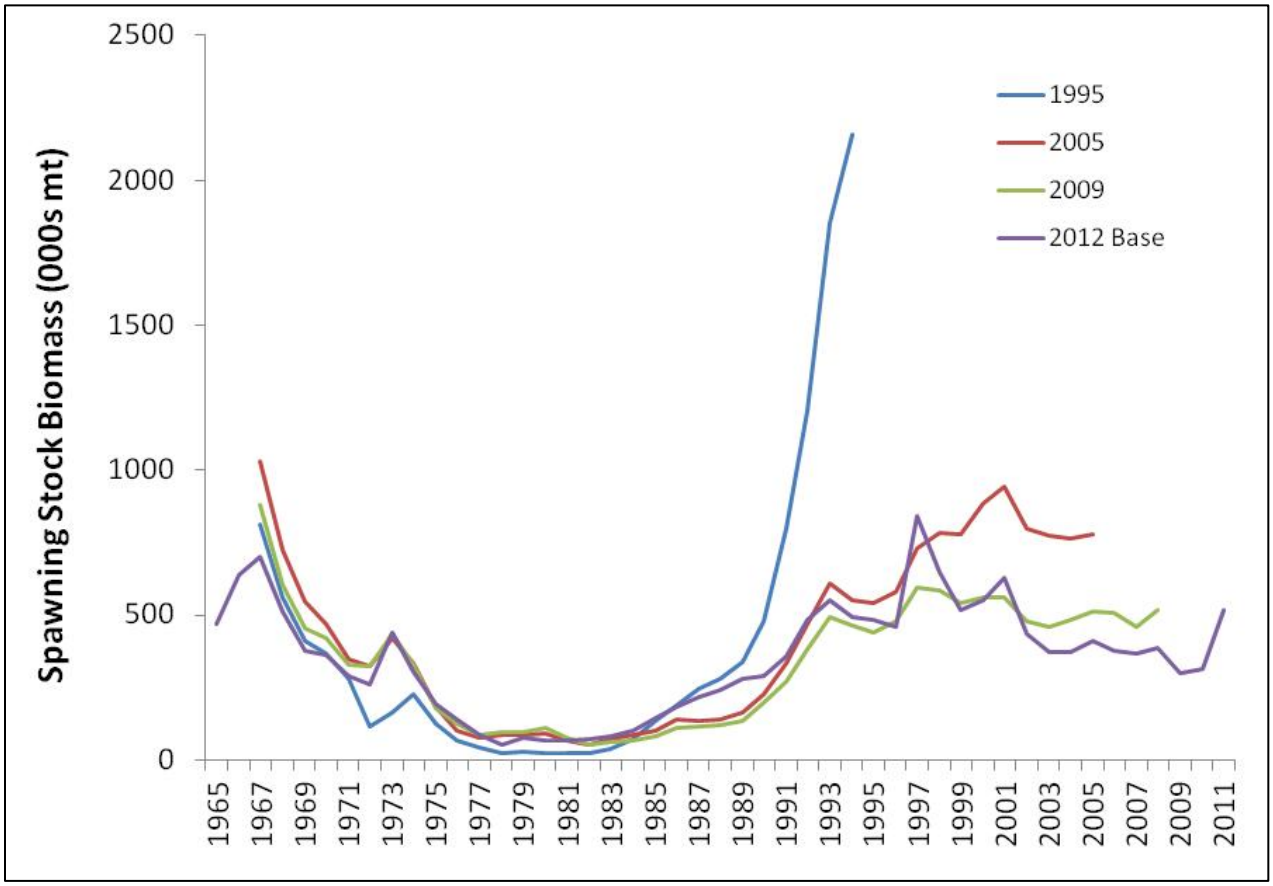


Source: Atlantic Herring Operational Assessment Meeting, April 8-9, 2015.

1.3 PREVIOUS ASSESSMENT UNCERTAINTY/FISHERY SPECIFICATIONS

This is not the first instance that a retrospective pattern has been identified in the Atlantic herring stock assessment and addressed as a primary source of uncertainty when setting herring fishery specifications (see Figure 4 and Table 2).

Figure 4 Historic Retrospective Pattern in SSB Estimated from Assessments in 1995, 2005 (TRAC), 2009 (TRAC) and the SAW 54 Base Run



The Herring PDT agreed that it may be helpful for the SSC to have some historical perspective on the degree of uncertainty in past Atlantic herring stock assessments, and the buffers that were established in the subsequent fishery specifications packages to account for those uncertainties. Table 2 summarizes the uncertainty identified from previous Atlantic herring stock assessments and the related SSC recommendations for catch advice. Additional detail is provided in the following discussion.

2013-2015 Atlantic Herring Fishery Specifications

When developing catch advice for the 2013-2015 Atlantic herring fishery specifications, the SSC considered projections at 75% F MSY as well as a constant catch approach. The SSC also considered two ABC control rules based on those utilized for forage fish in other regions. Given the condition of the Atlantic herring stock complex at that time, the control rules based on constant catch and 75% F_{MSY} were expected to produce approximately the same cumulative catch over the three years. The SSC noted that there is a higher risk of overfishing in the first year associated with the 75% F_{MSY} control rule and a higher risk of overfishing in the second and third years associated with the constant catch control rule. However, the SSC could not find any scientific reason to prefer one of these control rules over the other and considered them to be comparable in terms of risk of overfishing, given the information available. All considerations led the SSC to conclude that either control rule can be applied for 2013-2015 with low probability of overfishing or causing the stock to become overfished. The SSC recommended that the Council select either of these alternatives to specify ABC for the 2013-2015 fishing years.

The SSC considered a number of characteristics of the herring fishery and stock assessment before arriving at this decision regarding the ABC control rule for the 2013-2015 fishing years. The SSC did discuss the role of herring in the ecosystem and options for setting ecosystem-based ABCs. At that time, the SSC concluded that both control rules for the next three years would result in fishing mortality rates well below the natural mortality (M) rate and a stock size that is well above the standard biomass target, thereby likely meeting ecosystem-based biomass targets for a forage species by default if not by design. The SSC also agreed with the Herring PDT conclusion that natural mortality and consumption of herring by predators has been addressed in the SAW 54 benchmark 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 stock assessment more thoroughly than assessments for other species in the Northeast Region.

2010-2012 Atlantic Herring Fishery Specifications

The Atlantic herring specifications for 2010-2012 were developed based on a 2009 update to the 2006 TRAC benchmark assessment. During the development of the 2010-2012 fishery specifications, the Council considered factors identified by the SSC when setting ABC and accounted 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.

The SSC reviewed the TRAC update assessment and 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 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 magnitude of uncertainty in the herring assessment and reference points, the SSC could not derive an ABC control rule at that time and recommended a new benchmark assessment of herring as soon as possible. The SSC suggested that the next benchmark assessment should revise MSY reference points to be consistent with the assessment method and consider including estimates of consumption and spatial structure in the assessment (September 2009 SSC Report).

The average retrospective inconsistency in the estimate of exploitable biomass is approximately 40%, and according to the 2009 TRAC Report, "uncertainty due to model configuration is dwarfed by uncertainty due to retrospective bias." Therefore, the SSC considered that the magnitude of retrospective inconsistency accounts for the major sources of uncertainty in the assessment, and the buffer between OFL and ABC should be 40% (approximately 90,000 mt in 2010). Alternatively, the assessment suggested that recent catches have maintained a relatively abundant stock size (estimates of stock biomass from 1998 to 2008 have been greater than B_{MSY}) and low fishing mortality (estimates 1998 to 2008 fishing mortality have been less than F_{MSY}). Total catch of the herring stock complex by U.S. and Canada in 2008 was 90,000 mt. Given the consistency in catch advice from these two approaches, the SSC's initial recommendation was that ABC should be 90,000 mt each year until the stock assessment is revised.

At its September 2009 Council meeting, the Council approved a motion to request that "the SSC revisit the size of the 40% buffer between OFL and ABC to consider whether application of recent years retrospective difference of about 17% is sufficient to account for scientific uncertainty caused by retrospective patterns." The SSC considered the Council request and concluded that there is no scientific basis for a 17% buffer, and that a 17% buffer is insufficient to account for scientific uncertainty. However, the SSC recommended that, as an alternative approach, annual catches in 2010 to 2012 could be limited to recent catch. Catches were 90,000 mt in 2008; the average for 2006 to 2008 was 106,000 mt; and the average for 2004 to 2008 was 108,000 mt. Acceptable biological catch (ABC) for Atlantic herring was ultimately set by the Council at 106,000 mt for 2010-2012 (Table 2). An additional buffer was taken to account for management uncertainty (primarily Canadian catch), and the stockwide ACL for 2010-2012 was specified at 91,200 mt, with an opportunity to add 3,000 mt to the Area 1A fishery if the Canadian catch did not exceed 9,000 mt by November 1.

2007-2009 Atlantic Herring Fishery Specifications

Atlantic herring fishery specifications for the 2007-2009 fishing years were developed based on the 2006 TRAC (US/Canada) benchmark assessment results. Overall, the assessment indicated that the Atlantic herring stock complex had recovered to high levels and stabilized. Survey trends for the resource as a whole were updated and evaluated as part of the assessment remained relatively flat in more recent years. The resource appeared to have re-distributed throughout much of its historical range, and sampling suggests that the age structure of the stock had expanded, both of which are positive signs of a healthy, recovered stock complex. However, the assessment model exhibited a retrospective pattern. Despite this pattern, it was clear that current levels of removals from the stock complex (around 100,000 mt for the last 15 years) appear to be sustainable and should not cause concern relative to the health of the resource as a whole. The retrospective pattern in the model suggested that the Council may want to be cautious about allowing removals to increase significantly above what has been observed in the fishery over the last 15 years.

The 2007-2009 fishery specifications included an allowable biological catch (different from *acceptable biological catch*, ABC, after the 2007 MSA reauthorization) equivalent to the 2006 MSY value of 194,000 mt (Table 2). Optimum yield for the fishery was specified at 145,000 mt, and the buffer between MSY and OY accounted for Canadian catch (20,000 mt), the retrospective pattern in the stock assessment, other sources of assessment/scientific uncertainty, and the important role of herring in the Northwest Atlantic ecosystem.

Table 2 Summary of Previous Specifications for the Atlantic Herring Fishery and Buffers Between OFL/ABC

	2005-2006		2007-2009			2010-2012			2013-2015		
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
OFL	N/A	N/A	N/A	N/A	N/A	145,000	134,000	127,000	169,000	136,000	114,000
ABC	220,000	220,000	194,000	194,000	194,000	106,000	106,000	106,000	114,000	114,000	114,000
Total ACL/OY	150,000	150,000	145,000	145,000	145,000	91,200*	91,200	91,200	107,800	107,800	107,800
Catch (U.S.)	96,116	98,714	81,819	83,240	103,943	72,852	86,245	90,561	95,764	95,037*	*YTD
Catch (NB Weir)	13,055	12,863	30,944	6,448	4,031	10,958	3,711	504	6,431	2,149	N/A
Stock Assessment	2003 TRAC (US/Canada) Assessment		2006 TRAC (US/Canada) Benchmark Assessment			2009 TRAC (US/Canada) Update Assessment			SAW/SARC 54 Benchmark Assessment, June 2012		
Reference Points	B_{MSY} N/A; F_{MSY} N/A (0.2-0.25); MSY proxy 220,000		B_{MSY} 629,000; F_{MSY} 0.31; MSY 194,000			B_{MSY} 670,000; F_{MSY} 0.27; MSY 178,374			SSB_{MSY} 157,000; F_{MSY} 0.27; MSY 53,000		
Status	N/A		Rebuilt (~1M); Not overfishing (0.11)			Not Overfished (651,700; 97%); Not overfishing (0.14)			Rebuilt (518,000); Not overfishing (0.14)		
Uncertainty	Divergent assessment models; no agreement		Significant retrospective pattern			(1) Significant retrospective pattern; (2) MSY reference points			(1) 2008 Year Class; (2) Natural Mortality (M); Biological Reference Points		
Rationale	• SSC recommended that previous MSY (317,000) was too high; • Council originally proposed 180,000 OY; • Buffer for scientific uncertainty, importance of recruitment and forage, and Canadian catch		• Specifications were adopted during transition to OFL/ABC/ACLs under reauthorized MSA; • Buffer between ABC and ACL to account for retrospective pattern, Canadian catch (20,000), and forage/ecosystem			• SSC recommended 90,000 ABC (40% buffer) but Council asked SSC to revisit; SSC then recommended recent avg. catch, and Council selected 2006-2008 (106,000); • Buffer from ABC/ACL to account for NB weir catch; 3,000 added to 1A if NB weir catch less than 9,000; • Herring PDT – accounting for retro pattern should account for other uncertainty			• SSC – Constant catch and 75% FMSY produce close to the same catch/result over three years; • Provides more buffer in Years 1/2 for the 2008 YC; • Addressing M in this manner seems appropriate for this species; • Achieves result of ecosystem-based CR by default, if not by design; • Supported by industry (stability)		

Note: All numbers are expressed in metric tons (mt).

U.S. Atlantic herring catch estimates are NMFS-reported final estimates, derived from a combination of VTR and Dealer data (see Section 2.0).

1.4 SHORT-TERM CATCH PROJECTIONS (2016-2018)

When reviewing the short-term catch projections (2016-2018) provided in the operational assessment report (Table 4), the Herring PDT noted that in the last projection (based on 2015 ABC value of 114,000 mt), the application of the 2015 ABC value for the next three fishing years results in a probability of overfishing in Year 3 that is greater than 50%. The PDT agreed to provide a projection based on the application of the 2013-2015 Atlantic herring ABC control rule:

ABC Control Rule: The ABC control rule specifies ABC for three years based on the annual catch that is projected to produce a probability of exceeding F_{MSY} in the third year that is less than or equal to 50%. For 2013-2015, this value is 114,000 mt. The Council may modify this control rule or implement a new control rule at any time through a future management action.

The projection that is consistent with this control rule is provided in Table 3 below and produces a constant ABC of 111,000 mt for the 2016-2018 fishing years. The application of this control rule for 2016-2018 would allow for a greater buffer between OFL and ABC in 2016 and 2017, which may afford more protection to the 2011 year class that is just starting to recruit into the mobile gear fishery.

Table 3 Three-Year F/SSB Projection Based on 2013-2015 Atlantic Herring ABC Control Rule

	Constant Catch with Probability $F>F_{MSY}$ = 0.50 in 2018		
	2016	**2017**	**2018**
Median F	0.19	0.23	0.25
80%CI	0.13-0.29	0.15-0.36	0.15-0.42
Catch mt	111,000	111,000	111,000
80%CI	-	-	-
Median SSB mt	557,000	458,000	427,000
80%CI	343,000-942,000	283,000-760,000	237,000-738,000
Prob $SSB<(SSB_{MSY}/2)$	0.00	0.00	0.02
Prob $F>F_{MSY}$	0.23	0.43	0.50

Table 4 Atlantic Herring Operational Assessment: Three-Year Projections at F_{MSY}, 75% F_{MSY}, and 2015 Atlantic Herring ABC Value

	Harvest Scenario		
	F_{MSY}		
Result	**2016**	**2017**	**2018**
F	0.24	0.24	0.24
80%CI	-	-	-
Median Catch mt	138,000	113,000	107,000
80%CI	95,000-208,000	81,000-166,000	74,000-162,000
Median SSB mt	536,000	440,000	412,000
80%CI	354,000-880,000	312,000-669,000	282,000-631,000
Prob SSB<(SSB_{MSY}/2)	0.00	0.00	0.00
Prob F>F_{MSY}	-	-	-
	$0.75F_{MSY}$		
F	0.18	0.18	0.18
80%CI	-	-	-
Median Catch mt	106,000	90,000	88,000
80%CI	73,000-159,000	65,000-132,000	61,000-132,000
Median SSB mt	560,000	477,000	456,000
80%CI	369,000-914,000	337,000-721,000	314,000-695,000
Prob SSB<(SSB_{MSY}/2)	0.00	0.00	0.00
Prob F>F_{MSY}	-	-	-
	Status Quo ABC (114,000mt)		
Median F	0.19	0.24	0.26
80%CI	0.13-0.30	0.15-0.37	0.15-0.44
Catch mt	114,000	114,000	114,000
80%CI	-	-	-
Median SSB mt	555,000	454,000	421,000
80%CI	341,000-940,000	279,000-756,000	232,000-732,000
Prob SSB<(SSB_{MSY}/2)	0.00	0.00	0.02
Prob F>F_{MSY}	0.27	0.47	0.54

Table 4 continued. Atlantic Herring Operational Assessment: Three-Year Projections at F_{MSY}, 75% F_{MSY}, and 2015 Atlantic Herring ABC Value

	F_{MSY} with 2011 year class reduced to average		
F	0.24	0.24	0.24
80%CI	-	-	-
Median Catch mt	111,000	98,000	96,000
80%CI	74,000-176,000	70,000-149,000	65,000-149,000
Median SSB mt	446,000	392,000	370,000
80%CI	282,000-785,000	275,000-613,000	250,000-575,000
Prob SSB<(SSB_{MSY}/2)	0.00	0.00	0.00
Prob F>F_{MSY}	-	-	-

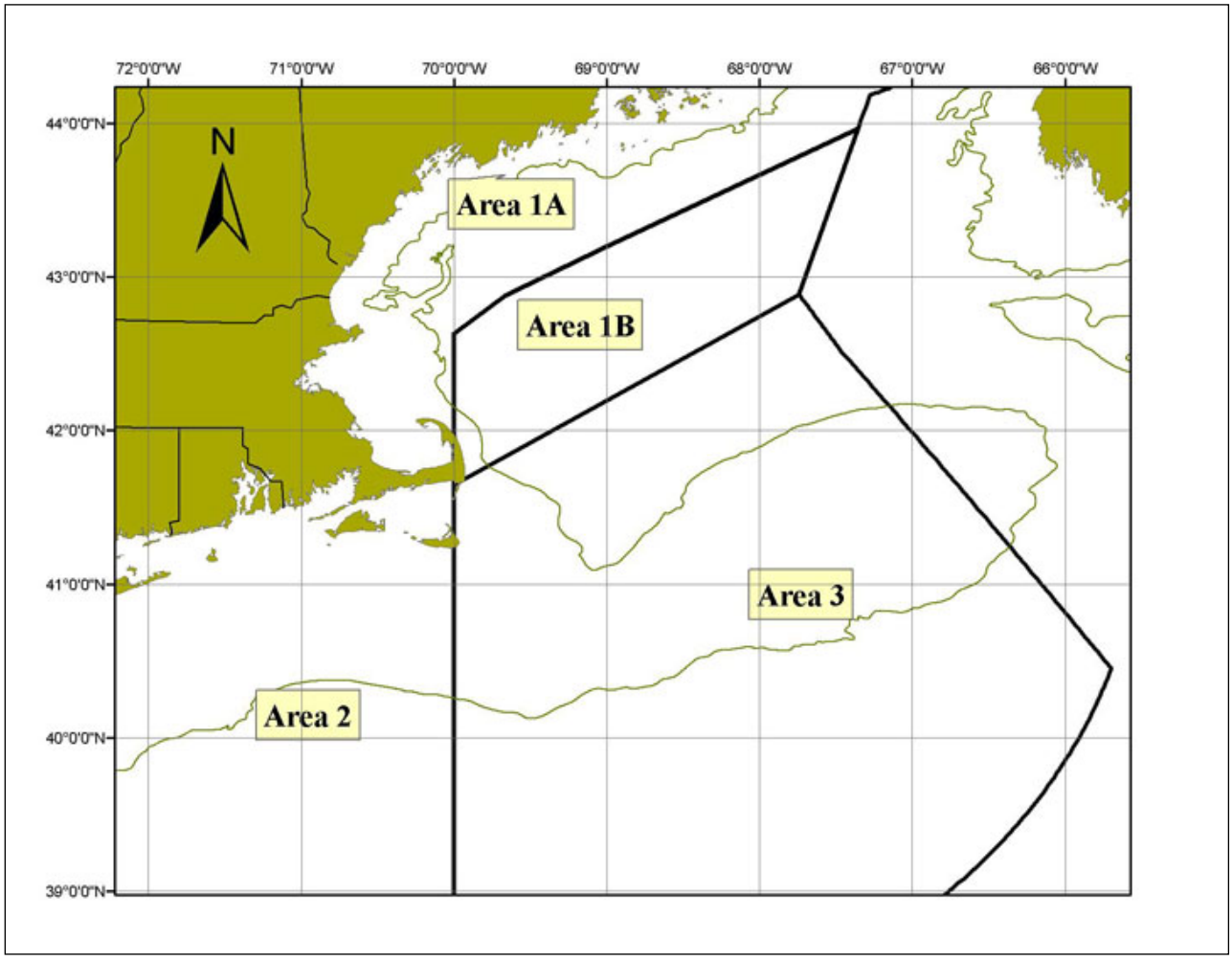
2.0 RECENT CATCH AND CURERNT (2013-2015) ATLANTIC HERRING FISHERY SPECIFICATIONS

The U.S. Atlantic herring fishery occurs over the Mid-Atlantic shelf region from Cape Hatteras to Maine, including an active fishery in the inshore GOM and seasonally on GB. The herring resource is managed as one stock complex, but this stock is thought to be comprised of inshore and offshore components that segregate during spawning. In recognition of the spatial structure of the herring resource, the herring annual catch limit (ACL) is divided into sub-ACLs and 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); Area 2 is located in the coastal waters between MA and NC, and Area 3 is on Georges Bank (GB) (Figure 5).

The Atlantic herring fishery is generally prosecuted south of New England in Area 2 during the winter (January-April), and oftentimes as part of the directed mackerel fishery. There is overlap between the herring and mackerel fisheries in Area 2 and in Area 3 during the winter months, although catches in Area 3 tend to be relatively low. The herring summer fishery (May-August) is generally prosecuted throughout the GOM in Areas 1A, 1B and in Area 3 (GB) as fish are available. Restrictions in Area 1A have pushed the fishery in the inshore GOM to later months (late summer). The midwater trawl (single and paired) fleet is restricted from fishing in Area 1A in the months of January through September because of the Area 1A sub-ACL split (0% January-May) and the purse seine-fixed gear only area (all of Area 1A) that is effective June-September. A sub-ACL split for Area 1B (0% January – April, 100% May – December) is effective for all vessels during the 2014 and 2015 fishing years.

Fall fishing (September-December) tends to be more variable and dependent on fish availability; the Area 1A sub-ACL is always fully utilized, and the inshore Gulf of Maine fishery usually closes sometime around November. As the 1A and 1B quotas are taken, larger vessels become increasingly dependent on offshore fishing opportunities (Georges Bank, Area 3) when fish may be available.

Figure 5 Atlantic Herring Management Areas



The 2013-2015 Atlantic herring fishery specifications are summarized in Table 5 are effective for the 2013-2015 fishing years (initial allocations, not including overage deductions, carryovers, or set-aside deductions). Updated 2015 Atlantic herring fishery specifications, based on 2013 overage deductions, are shown in Table 8.

Table 5 2013-2015 Atlantic Herring Fishery Specifications (Initial Allocations)

SPECIFICATION	2013-2015 ALLOCATION (MT)
Overfishing Limit (OFL)	169,000 – 2013 136,000 – 2014 114,000 – 2015
Acceptable Biological Catch (ABC)	114,000
U.S. Optimum Yield (OY)/Annual Catch Limit (ACL)	107,800
Domestic Annual Harvesting (DAH)	107,800
Domestic Annual Processing (DAP)	103,800
U.S. At-Sea Processing (USAP)	N/A
Border Transfer (BT)	4,000
Sub-ACL Area 1A	31,200
Sub-ACL Area 1B	4,600
Sub-ACL Area 2	30,000
Sub-ACL Area 3	42,000
Research Set-Aside (RSA)	3% of each sub-ACL
Fixed Gear Set-Aside (1A)	295

**Sub-ACL numbers do not include overage deductions, carryovers, or RSA deductions.*

Seasonal Splits for 2014 and 2015

- Area 1A: 0% January-May; 100% June-December
- Area 1B: 0% January-April; 100% May-December

In addition, midwater trawl vessels are prohibited from fishing in Area 1A from June-September of each year.

The Atlantic herring ACL and management area sub-ACLs are tracked/ monitored based on the total catch – landings and discards – which are provided and required by herring permitted vessels through daily vessel monitoring system (VMS) catch reports and weekly vessel trip reports (VTRs) as well as through Federal/state dealer data. Herring harvesters are required to report discards in addition to landed catch through these independent methods. NMFS' catch estimation methods for the Atlantic herring fishery are described in detail in both Framework Adjustment 2 and Framework Adjustment 3 to the Atlantic Herring FMP (see Section 3.6.1 of Framework 3, NEFMC 2014).

Table 6 summarizes recent Atlantic herring catch estimates by year and management area from 2004-2013. The following bullets describe how these estimates were derived:

- 2004-2006 herring catch estimates are provided from quota management implemented by NMFS through the Atlantic Herring FMP and are based on interactive voice reporting (IVR) data from the call-in system used to monitor TACs. Reported herring discards are included in the totals.
- 2007-2009 herring catch estimates are based on IVR data supplemented with dealer data. Reported discards are included in the totals.
- 2010-2013 Atlantic herring catch estimates are based on a comprehensive methodology developed by NMFS in response to Amendment 4 provisions and the need to better monitor sub-ACLs. The methodology for estimating catch is based on landings data obtained from dealer reports (Federal and State) supplemented with VTRs (Federal and State of Maine) with the addition of discard data from extrapolated observer data.

Table 6 Atlantic Herring Catch by Year and Management Area, 2004-2013

YEAR	AREA (sub-ACL)	CATCH (MT)	QUOTA (MT)	PERCENT of QUOTA CAUGHT
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	17,596	38,146	46%
2011	1A	30,676	29,251	105%
2011	1B	3,530	4,362	81%
2011	2	15,001	22,146	68%
2011	3	37,038	38,146	97%
2012	1A	24,302	27,668	88%
2012	1B	4,307	2,723	158%
2012	2	22,482	22,146	102%
2012	3	39,471	38,146	103%
2013	1A	29,820	29,775	100%
2013	1B	2,458	4,600	53%
2013	2	27,569	30,000	92%
2013	3	37,833	42,000	90%

Source: NMFS.
Note the shaded rows indicate overages.

Table 7 summarizes total Atlantic herring catch as a percentage of the total available catch in each year from 2003-2015YTD based on NMFS catch estimation methods. Atlantic herring catch has been somewhat consistent over the time period (and in previous years), averaging about 91,500 mt from 2003-2013, with the highest catch of the time series observed in 2009 and lowest in 2008. However, the quota allocated to the fishery (stockwide ACL/OY) has decreased 50% over the ten-year period. The herring fishery has therefore become more fully utilized in recent years and utilized 100% of the total ACL in 2012. The 2013-2015 Atlantic herring fishery specifications increased the stockwide Atlantic herring ACL available to the fishery by more than 15,000 mt; an additional 7,000 mt was caught under the higher quota in 2013, and overall, the fishery utilized about 90% of the stockwide herring ACL.

Table 7 Total Annual Atlantic Herring Catch 2003-2015

YEAR	TOTAL HERRING CATCH (MT)	TOTAL QUOTA ALLOCATED (MT)	PERCENT OF TOTAL QUOTA CAUGHT
2003	101,607	180,000	57%
2004	93,205	180,000	52%
2005	96,116	150,000	64%
2006	98,714	150,000	66%
2007	85,819	145,000	59%
2008	83,240	143,350	58%
2009	103,943	143,350	73%
2010	72,852	91,200	80%
2011	86,245	93,905	92%
2012	90,561	90,683	100%
2013	95,764	106,375	90%
2014*	95,037	107,322	89%
2015*	TBD	104,566	TBD

Source: NMFS. 2013 estimates have been updated, and 2014 estimates are preliminary.

Table 8 provides updated/adjusted Atlantic herring sub-ACLs and the total ACL for the 2015 fishing year relative to 2015 Atlantic herring catch year to date (YTD).

Table 8 2015 Atlantic Herring Sub-ACLs (Adjusted) and Catch YTD (mt)

AREA	2015 CATCH (MT)	2015 SUB-ACL* (MT)	% SUB-ACL CAUGHT
1A	0	30,290	0%
1B	1,877	4,922	38%
2	11,356	32,100	35%
3	7,915	44,910	18%
TOTAL	**21,147**	**104,566**	**20%**

Source: NMFS Quota Monitoring Report May 18, 2015.

**Adjustments to initial allocations include overage deductions/carryovers from 2013 and deductions for the 2015 research set-asides.*

3.0 RIVER HERRING/SHAD (RH/S)CATCH CAP INFORMATION/ANALYSIS

Dr. Dean presented the Herring PDT with an overview of updated RH/S catch estimates by gear type and RH/S catch cap area for the 2013 and 2014 fishing years.

TBD