Atlantic States Marine Fisheries Commission

Atlantic Herring Management Board

August 2, 2022
9:00 – 10:30 a.m.
Hybrid Meeting

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order *(M. Ware)*	9:00 a.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from October 2021	9:00 a.m.
3.	Public Comment	9:05 a.m.
4.	Review 2022 Atlantic Herring Management Track Assessment and Peer Review Report *(J. Deroba)*	9:15 a.m.
5.	Update on Portside Sampling Program *(M. Cieri)*	9:55 a.m.
6.	Update from New England Fishery Management Council *(J. Cournane)*	10:20 a.m.
7.	Other Business/Adjourn	10:30 a.m.

The meeting will be held at The Westin Crystal City (1800 Richmond Highway, Arlington, VA; 703.486.1111) and via webinar; click here for details

MEETING OVERVIEW

Atlantic Herring Management Board
August 2, 2022
9:00 a.m. – 10:30 a.m.
Hybrid

Chair: Megan Ware Assumed Chairmanship: 08/22	Technical Committee Chair: Renee Zobel (NH)	Law Enforcement Committee Representative: Delayne Brown (NH)
Vice Chair: Vacant	Advisory Panel Chair: Jeff Kaelin (NJ)	Previous Board Meeting: October 18, 2021
Voting Members: ME, NH, MA, RI, CT, NY, NJ, NMFS, USFWS (9 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from October 2021

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Review 2022 Atlantic Herring Management Assessment and Peer Review Report (9:15-9:55 a.m.)

Background

- The Management Track Assessment was completed in May and peer-reviewed in late June 2022 **(Supplemental Materials)**.
- The New England Fishery Management Council's (NEFMC) Scientific and Statistical Committee (SSC) is scheduled to meet August 4 to develop recommendations for 2023-2025 fishery specifications, which will be considered at the NEFMC September meeting.

Presentations

- Presentation of management track assessment by J. Deroba

5. Update on Portside Sampling Program (9:55-10:20 a.m.)

Background

- The Maine Department of Marine Resources' (DMR) portside sampling program collects and processes samples from Atlantic herring commercial landings along the coast, which informs stock assessments and management.
- ACCSP funding for the Maine DMR portside sampling program will expire in 2023.

Presentations

- Presentation of portside sampling program by M. Cieri

6. Update from New England Fishery Management Council (10:20-10:30 a.m.)

Background

- The New England Fishery Management Council (NEFMC) discussed three issues related to Atlantic herring during its June 2022 meeting **(Supplemental Materials)**.
- In July 2022, the final rule was published for Framework 9 to the federal Atlantic Herring Fishery Management Plan, which establishes a herring rebuilding plan, adjusts accountability measure catch threshold triggers, and revises and clarifies existing regulations.

Presentations

- Presentation of NEFMC update (J. Cournane)

6. Other Business/Adjourn (10:30 a.m.)

draft working paper for peer review only

Atlantic Herring

2022 Management Track Assessment Report

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts

Compiled May 2022

This assessment of the Atlantic Herring (Clupea harengus) stock is a management track assessment of the existing 2020 management track assessment conducted using the ASAP model. Based on the previous assessment, the stock was overfished but overfishing was not occurring. This assessment updated fishery catch data, survey indices, life history parameters (e.g., weights-at-age), and the ASAP assessment model and reference points (BRPs) through 2021. Several notable changes were made and these were described more thoroughly below.

State of Stock: The methods used to derive BRPs and conduct short-term projections were changed as part of this management track assessment. Briefly, two notable changes were made to the methods used to calculate BRPs: 1) as recommended in the previous management track, long-term projections used to define BRPs accounted for mortality from the fixed gear fishery. The fishing mortality equaled the average of the estimated fishing mortalities from the most recent 10 years. 2) The recruitment stanza used to define BRPs was 1992-2019. The sequence of poor recruitments at the end of the time series suggested an unprecedented situation that made continued use of the entire time series (i.e., beginning 1965) untenable. It is likely that some combination of spawning stock size and environmental conditions are driving recruitment. A changepoint analysis (Killick and Eckley 2014) was applied to the recruitment and recruits/spawner time series to disentangle these effects. The analysis identified a changepoint in 1992 in the recruits/spawner time series that was not identified in the recruitment time series, suggesting a shift in environmental conditions effecting recruitment happened at that time. Thus the range of years used to define BRPs was 1992-2019 (2020-2021 estimates were not used due to uncertainty, as in previous assessments). Based on this management track assessment, the Atlantic Herring (*Clupea harengus*) stock is overfished and overfishing is not occurring (Figures 1-2). Retrospective adjustments were necessary (SSB Mohn's rho = 0.447 and F Mohn's rho = -0.21). Spawning stock biomass (SSB) in 2021 was estimated to be 39,091 (mt) which is 21% of the biomass target (SSB_{MSY} *proxy* = 185,750; Figure 1). The 2021 average fishing mortality for ages 7-8 (fully selected ages for the mobile fleet) was estimated to be 0.153 which is 31% of the overfishing threshold proxy (F_{MSY} *proxy* = 0.5; Figure 2).

Table 1: Catch and status table for Atlantic Herring. All weights are in mt, recruitment is in 000s, and $\bar{F}_{7-8}$ is the average fishing mortality on ages 7 to 8, which are fully selected by the mobile fleet. Model results are from the current updated ASAP assessment and the values in this table are not adjusted for the retrospective pattern.

	2014	2015	2016	2017	2018	2019	2020	2021
				Data				
US Catch	93,084	81,204	62,597	48,796	45,527	12,792	8,076	5,202
Canadian Catch	1,465	146	4,132	2,133	13,036	5,821	6,041	2,663
Total Catch	94,549	81,350	66,729	50,929	58,563	18,613	14,117	7,865
				Model Results				
Spawning Stock Biomass	292,370	228,600	145,350	105,790	65,529	53,441	51,749	56,566
$\bar{F}_{7-8}$	0.48934	0.48842	0.50347	0.53369	0.7291	0.3394	0.19665	0.1207
recruits (age1)	1,316,100	704,910	343,530	859,750	692,800	1,571,000	863,790	2,144,500

Table 2: Comparison of reference points estimated in an earlier assessment and from the current assessment. An $F_{40\%}$ proxy was used for the overfishing threshold, and the biomass proxy reference point was based on long-term, stochastic, projections. 95% CI were reported in parentheses.

	2020	2022
F_{MSY} *proxy*	0.54	0.5
SSB_{MSY} (mt)	269,000 (155,699 - 444,290)	185,750 (91,100 - 355,800)
MSY mt	99,400 (62,644 - 151,814)	68,980 (37,390 - 120,154)
Median recruits (age 1)	3,430,614 (915,478 - 10,132,087)	2,820,600 (578,900 - 10,441,500)
Overfishing	No	No
Overfished	Yes	Yes

Projections: The short-term projections presented here differed from the previous assessment in that they assumed recruitment followed an autoregressive process (AR(1)) rather than random draws from the cumulative distribution of estimated recruitments. The paramters defining the AR process were estimated using recruitment estimates from 1992-2019 using the R package arima (R Core Team 2020). The AR process was initiated using the rho adjusted 2021 recruitment estimate (i.e., 1,483,061). The projection results included here should be considered preliminary and subject to change based on future assessment and management decisions. This example projection applied the harvest control rule described in Amendment 8 of the hering Fishery Management Plan to the mobile fleet. The fixed gear catches are assumed constant during the projection period and equaled 4,238 mt. This fixed gear catch equals the sum of the ten year (2012-2021) averages of the Canadian (4,220 mt) and US (18 mt) fixed gear catches. The US fixed gear catches are those from stop seines, weirs, and pound nets. The reported $\bar{F}_{7-8}$ are those for the mobile fleet.

Table 3: Projection results. See above and supplementary document for details.

Year	Catch mt	SSB (mt)	$\bar{F}_{7-8}$
2022	8,767	61,645	0.097

Year	Catch mt	SSB (mt)	$\bar{F}_{7-8}$
2023	16,649	79,231	0.232
2024	23,409	76,795	0.327
2025	28,181	103,645	0.313

Special Comments:

- What are the most important sources of uncertainty in this stock assessment? Explain, and describe qualitatively how they affect the assessment results (such as estimates of biomass, F, recruitment, and population projections).

  A definitive explanation for the continued poor recruitment has not been identified. While identifying a causal mechanism for poor recruitment would be immensely beneficial, finding explanations for patterns in recruitment have been elusive in fisheries science for decades. Another uncertainty in this assessment is natural mortality. In this assessment, natural mortality was assumed constant among ages and years. Justifications for including age- or time-varying natural mortality in previous assessments have quickly deteriorated. Uncertainty in natural mortality affects the scale of abundance and fishing mortality estimates, but is unlikely to be related to the recent poor recruitments. Stock structure, particularly mixing with Nova Scotian herring, is also an uncertainty. Migration can be conflated with changes in mortality and contribute to retrospective patterns. Again, however, this is unlikely to explain recent poor recruitment.

- Does this assessment model have a retrospective pattern? If so, is the pattern minor, or major? (A major retrospective pattern occurs when the adjusted SSB or $\bar{F}_{7-8}$ lies outside of the approximate joint confidence

region for SSB and $\bar{F}_{7-8}$).

This assessment model had a retrospective pattern that could be classified as major and required adjustments. While recent assessments have not had major retrospective patterns, these assessments also suggested that the lack of a retrospective pattern could be due to structural changes in the model (e.g., splitting the NMFS BTS survey in 2009 when the R/V Bigelow came into service; NEFSC 2018) and so the reemergence of a retrospective pattern was not suprising.

- Based on this stock assessment, are population projections well determined or uncertain? If this stock is in a rebuilding plan, how do the projections compare to the rebuilding schedule?

  The projections are uncertain, especially in regards to recruitment. The lack of 2020 survey data, and the fact that neither indices of abundance or the fishery consistently harvest age-1 herring, made estimation of the most recent two years of recruitment impossible without the addition of a likelihood penalty. Without other information about recruitment, the likelihood penalty has the effect of pulling the more recent recruitment estimates (i.e., 2020 and 2021) upwards towards the median. The upward increase in recent recruitments was partially offset in projections by applying a retrospective adjustment. Furthermore, assumptions about terminal year recruitment do not have much effect on projection results for 3 or more years because herring are 50% selected by the mobile fleet at about age-4, which causes a delay in the effect of terminal year recruitment assumptions. Just the same, recruitment is a significant uncertainty. Based on the projections done during this management track, the stock is behind the rebuilding schedule (See Framework 9 table 26). The rebuilding plan suggested the population would have a 43% chance of rebuilding by 2025, but this assessment projects only an 11% chance in that year. The rebuilding plan, however, used the full time series of recruitments when defining reference points and proejctions, which makes them more optimistic than the shortened time frame of recruitments and the AR(1) process applied in this assessment. A sensitivity using an AR(1) process was done during development of the rebuilding plan, but even those projections were more optimistic (25% chance of rebuilding in 2025) than those done during this assessment.

- Describe any changes that were made to the current stock assessment, beyond incorporating additional years of data and the effect these changes had on the assessment and stock status.

  NMFS bottom trawl indices of abundance since 2009 were calculated using tow-specific measured tow distance, instead of an assumed constant for all tows. This change had a negligible effect. The methodology used to calculate Canadian catches, age composition, and weights at age was revised, resulting in entirely new time series, but the effect on the assessment was negligible. The age composition of the NEFSC shrimp survey was previously based on an average of the NMFS spring and fall age-length keys. Three years of age data collected during this survey replaced the use of borrowed age-length keys, and this had a negligible effect on the assessment. The addition of a likelihood penalty on recruitment became necessary given the lack of information about recent cohort sizes (i.e., missing 2020 survey data). The likelihood penalty had the effect of increasing the estimates of recent recruitments toward the median level. The two most recent recruitments were still relatively poor, however, and were excluded when calculating BRPs and when estimating parameters of the AR(1) process used in short-term projections. Thus, the overall effect of the penalty on the assessment and stock status was negligible. An attempt was made to avoid using the likelihood penalty by deriving an age-1 recruitment index from seabird diet data. While an assessment that included such an index did not require a likelihood penalty, the model did not fit the index well (e.g., patterned residuals). Concerns about non-linearity between the seabird index and herring recruitment, and a lack of time to understand this novel data source, precluded its use in this assessment. An index derived from seabird diet data has promise, however, and could be persued in the future.

- If the stock status has changed a lot since the previous assessment, explain why this occurred.

  The stock status has not changed a lot since the previous assessment.

- Provide qualitative statements describing the condition of the stock that relate to stock status.

  Continued poor recruitment is the main issue driving stock status. Management decisions that reduced US catches had the effect of avoiding overfishing.

- Indicate what data or studies are currently lacking and which would be needed most to improve this stock assessment in the future.

Studies related to stock structure and movement would be beneficial, as this has been proposed as a possible explanation for retrospective patterns. While an explanation for drivers of recruitment would be beneficial, it would not directly effect the assessment, and as noted, such explanations are difficult to identify. An index of age-1 recruitment based on seabird diet data was attempted in this assessment, but was ultimately not included. This index could be especially informative because the fishery and indices based on bottom trawls do not consistently capture age-1 herring, and information on recent recruitments in this assessment was especially lacking due to the absence of 2020 bottom trawl surveys. The seabird diet data are collected by multiple entities (National Audubon Society, USFWS, University of New Brunswick, and University of New Hampshire). Collating this data and developing the index was a tremendous undertaking, only made possible by willing collaborators that collect the data and a volunteer student (Sean Hardison, University of Virginia). Continued consideration of this data would benefit from more formal and streamlined sharing agreements with NMFS.

- Are there other important issues?
  No other important issues were identified.

References:

NEFSC (Northeast Fisheries Science Center). 2018. 65^{th} Northeast Regional Stock Assessment Workshop (65^{th} SAW) Assessment Report. US Dept. of Commerce, NEFSC Ref. Doc. 18-11.

Killick, R. and I.A. Eckley. 2014. changepoint: an R Package for Changepoint Analysis. Journal of Statistical Software 58(3).

R Core Team. 2020. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/ (last accessed 20 March 2020).

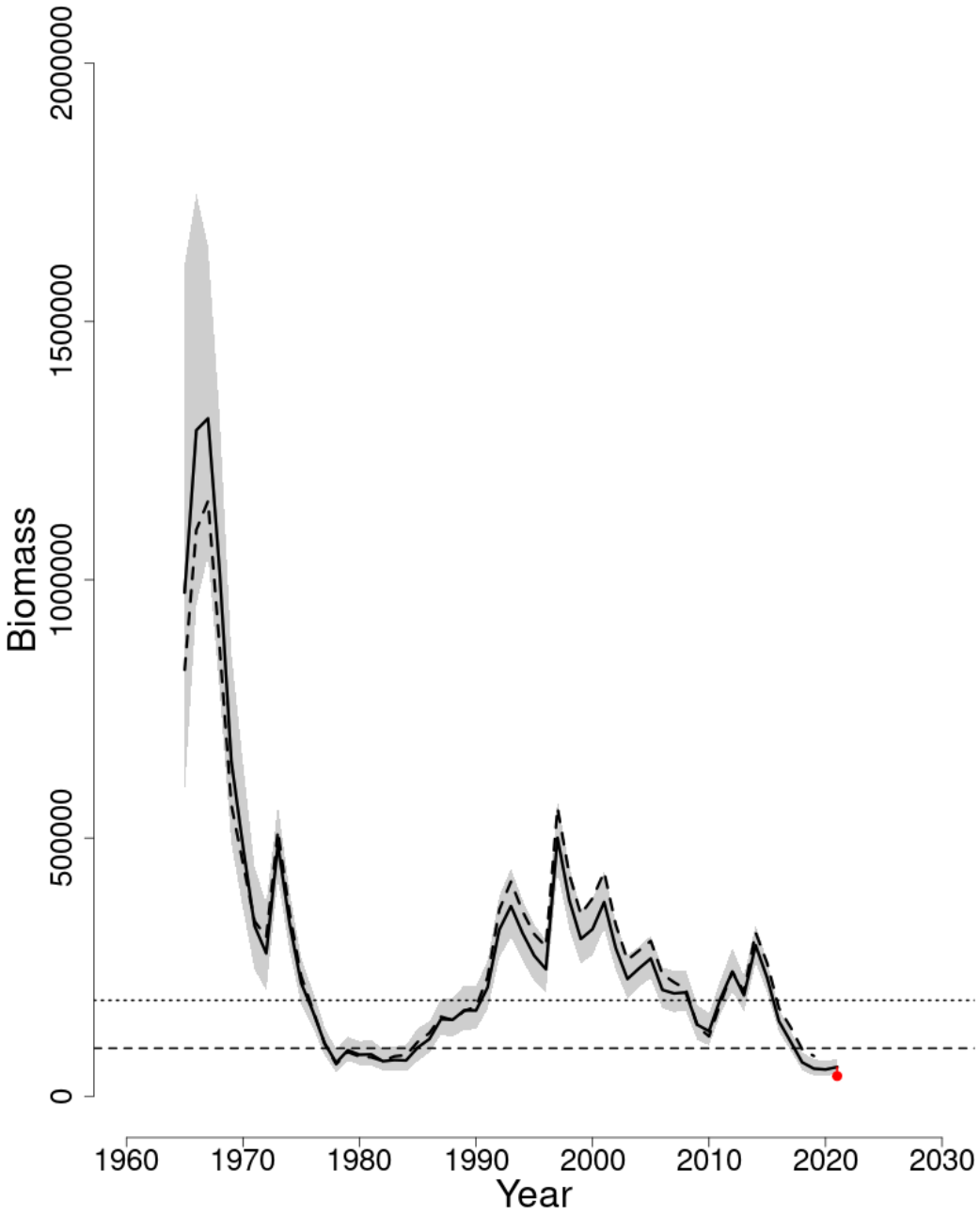

Figure 1: Trends in spawning stock biomass of Atlantic Herring between 1965 and 2021 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{Threshold}$ ($\frac{1}{2}$ SSB_{MSY} *proxy*; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} *proxy*; horizontal dotted line) based on the 2022 assessment. The approximate 90% confidence intervals are shown.

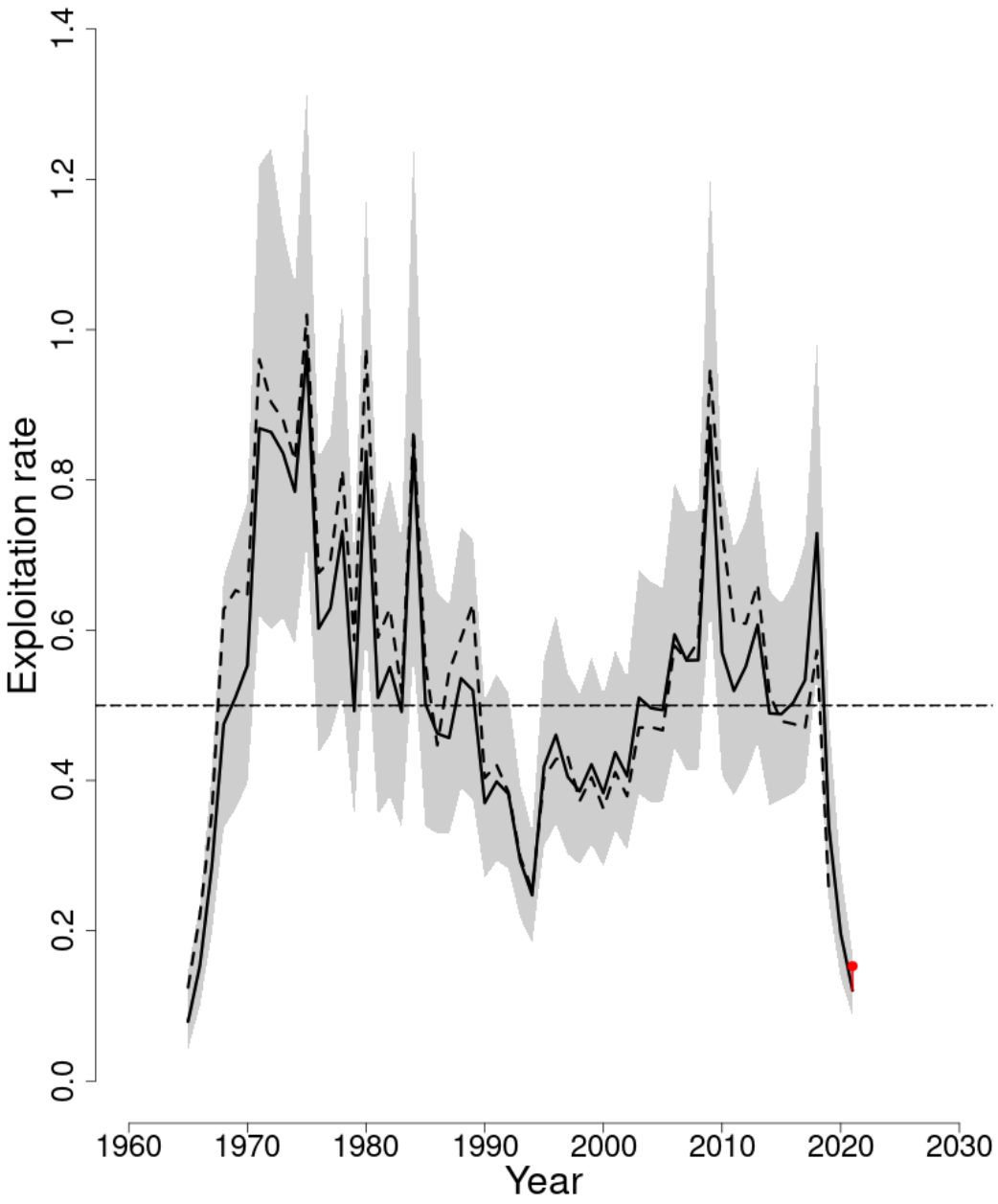

Figure 2: Trends in the average fishing mortality rate for ages 7-8, which are fully selected by the mobile fleet ($\bar{F}_{7-8}$), between 1965 and 2021 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{Threshold}$ (F_{MSY} *proxy*=0.5; horizontal dashed line). The approximate 90% confidence intervals are shown.

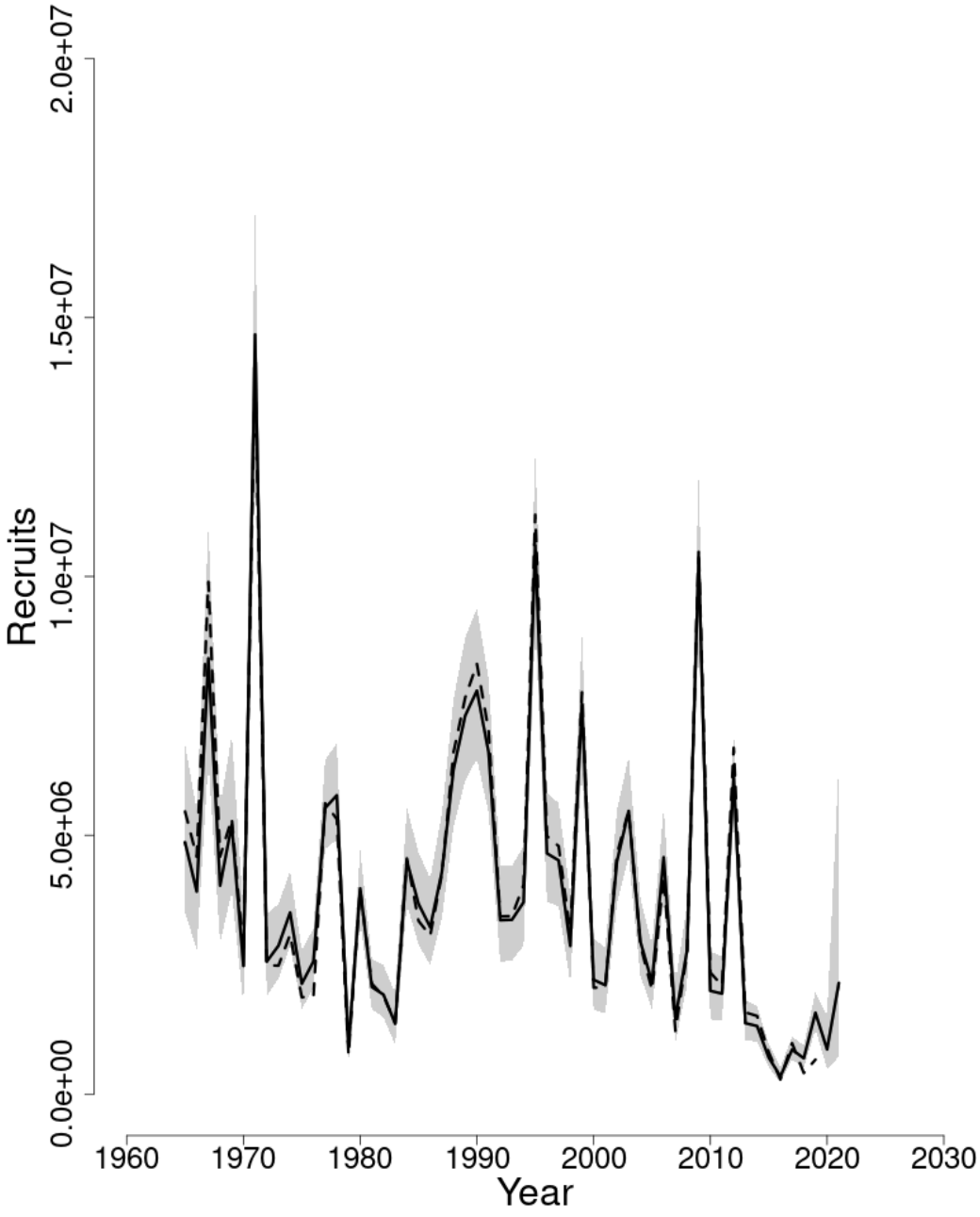

Figure 3: Trends in recruits (age-1)(000s) of Atlantic Herring between 1965 and 2021 from the current (solid line) and previous (dashed line) assessment. The approximate 90% confidence intervals are shown.

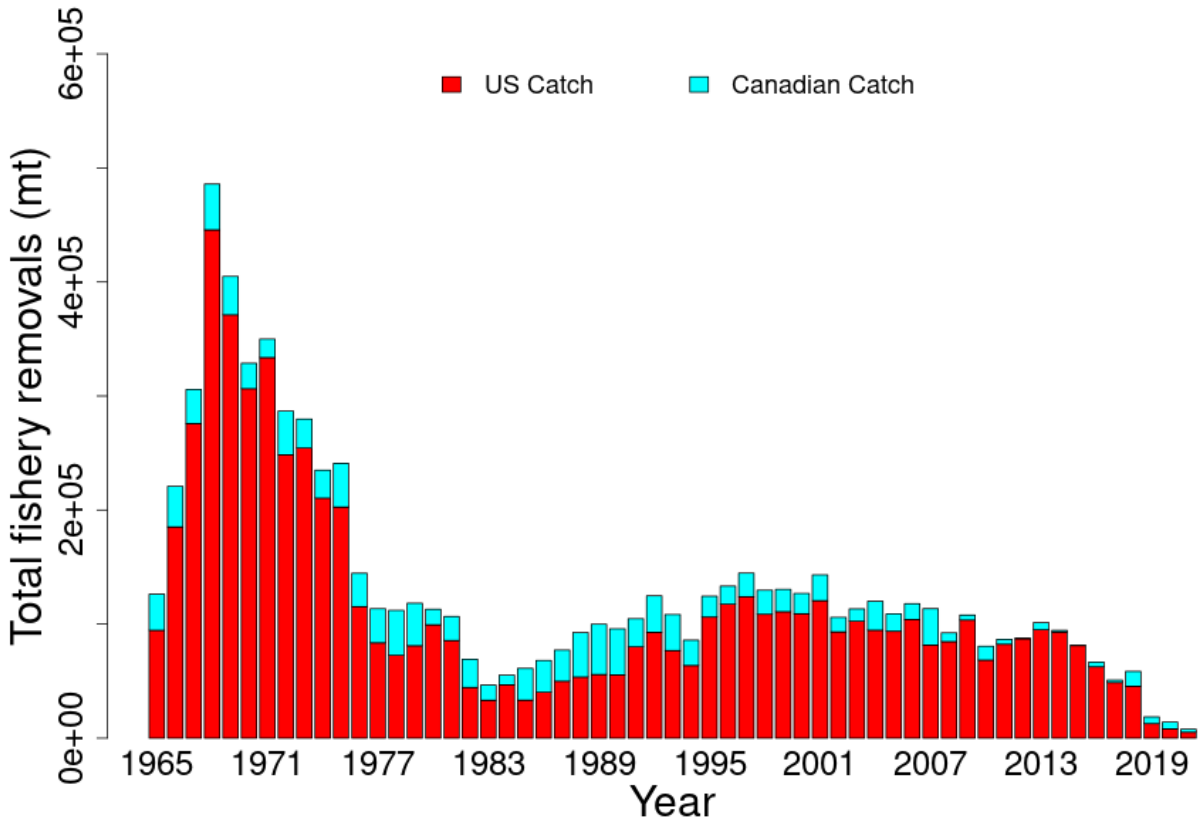

Figure 4: Total catch of Atlantic Herring between 1965 and 2021 by US and Canadian fleets.

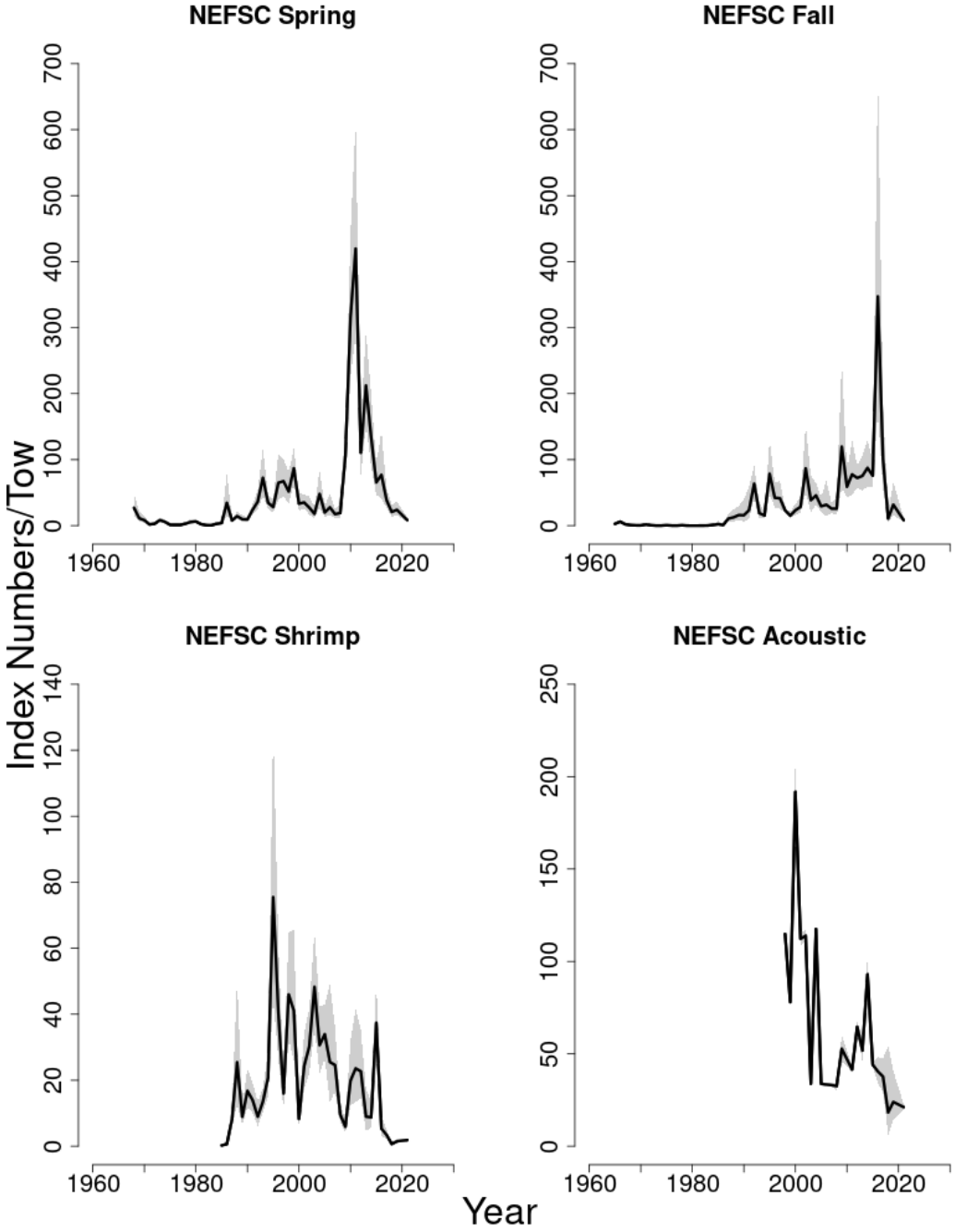

Figure 5: Indices of abundance for Atlantic Herring between 1965 and 2021 for the Northeast Fisheries Science Center (NEFSC) spring, fall, and shrimp bottom trawl surveys. The NEFSC acoustic index is collected during the fall bottom trawl survey and is in units of acoustic backscatter, not absolute numbers. The approximate 90% confidence intervals are shown.

New England Fishery Management Council

FOR IMMEDIATE RELEASE
July 12, 2022

PRESS CONTACT: Janice Plante
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Atlantic Herring: Council Receives Update on 2023-2025 Specs; Discusses Status of Framework 7, Industry-Funded Monitoring

The New England Fishery Management Council covered three issues related to Atlantic herring when it met June 28-30, 2022 for a hybrid meeting in Portland, Maine.

SPECIFICATIONS: The Council received a brief update on 2023-2025 herring specifications, which are under development. The Herring Plan Development Team (PDT) is working on the action, and the Council's Scientific and Statistical Committee will develop the overfishing limit (OFL) and acceptable biological catch (ABC) recommendations at an August 4, 2022 meeting. The annual catch limit (ACL), area-specific sub-ACLs, and other fishery specifications will flow from the ABC. The Herring Advisory Panel and Herring Committee will meet later this summer to review the specifications and recommend preferred alternatives for Council consideration. The Council will take final action during its September 27-29, 2022 meeting.

The specifications will be informed by the peer reviewed results of the June 2022 Herring Management Track Assessment, which was conducted immediately preceding the start of the Council meeting. Herring was last assessed in 2020 and was determined to be overfished, although overfishing was not occurring. Results from the new 2022 assessment are being finalized, but it does not appear the status of the resource has changed much from the previous assessment.

FRAMEWORK ADJUSTMENT 7: The Council initiated Framework 7 in 2019. The current focus is to protect spawning adult herring on Georges Bank and Nantucket Shoals. The Council agreed to pause further PDT work on the framework for the summer. At its next meeting, the Herring Committee will take up a tabled motion about whether Framework 7 should be discontinued given: (a) very little fishing is presently occurring in offshore areas, and the limited activity is occurring outside of the spawning season; and (b) much more work is needed to develop spawning protections that can be effectively monitored.

Sampling Atlantic herring.
– UMass Dartmouth SMAST photo

INDUSTRY-FUNDED MONITORING (IFM): The Council considered whether to revise the IFM program for herring but opted not to initiate an action considering: (1) the IFM program will be on hold after April 2023 unless federal funds are identified to administer the program; and (2) a program review is required in 2023.