June 2026 Management Track Peer Review Panel Report

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Executive Summary

The June 2026 Management Track (MT) peer review Panel (Panel) reviewed two stock assessments: Georges Bank haddock (*Melanogrammus aeglefinus*) and Atlantic herring (*Clupea harengus*). The Panel met in person in the USGS' Woods Hole Coastal and Marine Science Center in Falmouth, MA with hybrid capabilities on June 29-30, 2026. The Panel was to determine whether each completed MT Assessment was technically sufficient to a) evaluate stock status, b) provide scientific catch advice, and c) successfully address the assessment Terms of Reference (Appendix A).

Attendance at the meeting is provided in Appendix B, and the agenda for the peer review is available in Appendix C. An explanation of the major acronyms used in the report is provided in Appendix D.

Table 1 presents a list of the stocks, name of the assessment lead, and conclusions about stock status. Table 2 presents a summary of recommendations by stock made by the Panel.

We thank Kristan Blackhart (Population Dynamics Branch Chief) and Brian Hopper (Assessment Process Lead, Resource Evaluation and Assessment Division) for their support during the meeting and to Liz Brooks and Jon Deroba of the staff of the Population Dynamics Branch for the open and collaborative spirit with which they engaged the Panel.

Our thanks also extend to numerous NEFSC staff for taking extensive notes during the meeting, and who, along with Jamie Cournane and Robin Frede of the New England Fishery Management Council, provided context and additional background.

Georges Bank Haddock

The Panel concluded that the 2026 assessment update for Georges Bank haddock is technically sufficient to evaluate stock status and provide scientific advice and meets most of the Terms of Reference for the stock's assessment except for TORs 5 and 6 which were partially met. The assessment represents Best Scientific Information Available (BSIA) for this stock for management purposes.

The 2026 assessment of the Georges Bank haddock (*Melanogrammus aeglefinus*) stock is an update of the 2024 management track assessment, which used the Woods Hole Assessment Model (WHAM) framework. Prior to the 2022 research track, the last benchmark for this stock was in 2008 (Brooks et al., 2008).

This assessment updates commercial fishery catch data, research survey indices of abundance, weights- and maturity-at-age, and the WHAM assessment model and reference points through 2025. Based on this assessment, the stock was not overfished and overfishing was not occurring.

Stock projections have been updated through 2031. However, the Panel found that the high uncertainty in the stock's terminal year abundance estimate and the moderately strong retrospective pattern suggest projections beyond one or two years should be considered to be highly uncertain. The Panel feels it is extremely risky to set catch advice that would lead to fishing down the 2020 year class and the 2021 year class without confirming another recruitment year.

Atlantic Herring

The Panel concluded that the 2026 assessment update for Atlantic herring is technically sufficient to evaluate stock status and provide scientific advice and meets most of the Terms of Reference for the stock's assessment except for TOR 5 which was partially met. The assessment represents Best Scientific Information Available (BSIA) for this stock for management purposes.

This 2026 assessment of the Atlantic herring (*Clupea harengus*) stock is the first application of the WHAM assessment platform following the 2025 research track assessment (NEFSC 2025). The last management track assessment was in 2024 and was conducted using the ASAP model. Based on that 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 WHAM assessment model and reference points (BRPs) through 2025. Stock projections have been updated through 2031.

The change in assessment platforms from the 2024 management track makes comparisons among the assessments inappropriate. Several relatively minor changes have been made since the research track. Namely, a revised Canadian catch time

series was used, a different approach was used for input effective sample sizes, and spawning stock biomass weight-at-age values were corrected. The Panel found that the inability to account for the annual variability and downward trend in the numbers-at-age random effect deviations in the projections undermined confidence in the model projections.

Table 1. Stocks reviewed *at June 2026 Management Track Assessment Peer Review meeting.*

Stock	Assessment Lead	Peer Review Panel Conclusion on Stock Status
Georges Bank haddock	Liz Brooks	Stock is not overfished and overfishing is not occurring
Atlantic herring	Jonathan Deroba	Stock is overfished and overfishing is not occurring

Table 2. Summary of Peer Review Panel recommendations by stock from June 2026 Track Assessment Peer Review meeting.

Stock	Peer Review Panel Recommendations
Georges Bank haddock	● Evaluate how density dependence, environmental change and other factors produce changes in GB haddock indices used in the assessment ● Evaluate the effect of decreasing WAA on selectivity-at-age ● Continue investigating retrospective patterns and diagnostics in state-space models ● Evaluate whether conditioning on the random effects is influencing the retro observed in self-tests ● Evaluate factors that could provide for the stability of SSB estimates in the face of declining survey indices and primarily negative NAA random effect deviations in the last 5 years ● Continue evaluation of appropriate methods for scaling recruitment in the calculation of reference points for this stock and development of dynamic BRPs ● Continue to conduct studies to evaluate gutted:whole conversion factors and length-weight for commercial landings ● Continue to characterize differences in the separate Georges Bank and eastern Georges Bank WHAM models

Stock	Peer Review Panel Recommendations
Atlantic herring	● Conduct sensitivity analysis to evaluate how different CVs (and perhaps misreporting) of the Canadian weir catch influence model estimates ● Develop estimates of the portion of catches in the fixed and mobile gears catches that come from US and Canadian stocks ● Continue work on the development of the VAST model to integrate state and federal surveys particularly with respect to use of surveys that include information on age-1 fish (ME-NH survey) ● Continue exploring use of the seabird diet data as an index of age-1 abundance ● Continue exploration of survey data to determine whether Atlantic herring distribution has changed ● Investigate the potential for autocorrelation in annual recruitment, as well as explore covariate(s) aliased in the NAA random effects and determine which is having the most effect on interannual patterns. ● Continue exploration of recruitment stanzas underlying reference points for Atlantic herring ● Reconsider the appropriateness of F40% for an F% more responsive to the changes in productivity that herring are experiencing. ● Revisit decisions on random effects as additional years of data are added as model diagnostics may support alternative configurations as new information is added. ● Review use of geometric mean recruitment of the full time series to inform projections, rather than more recent conditions.

Georges Bank Haddock

Summary

The Panel concluded that the 2026 assessment update for Georges Bank haddock is technically sufficient to evaluate stock status and provide scientific advice and meets most of the Terms of Reference for the stock's assessment except for TORs 5 and 6 which were partially met. The assessment represents Best Scientific Information Available (BSIA) for this stock for management purposes.

This 2026 assessment of the Georges Bank haddock (*Melanogrammus aeglefinus*) stock is an update of the 2024 management track assessment[1], which used the Woods Hole Assessment Model (WHAM) framework. Prior to the 2021-22 research track, the last benchmark for this stock was in 2008 (Brooks et al., 2008)[2]. Based on the previous update assessment in 2024, the stock was not overfished and overfishing was not occurring.

This assessment updates commercial fishery catch data, research survey indices of abundance, weights- and maturity-at-age, and the WHAM assessment model and reference points through 2025. Stock projections have been updated through 2031.

TOR 1. Estimate catch from all sources including landings and discards.

This TOR was Met.

US Commercial discards and landings (from CAMS), Canadian discards and landings, and the associated catch-at-age and weight-at-age (WAA) were all updated through 2025. There are striking patterns of decline in the catch WAA for this stock that warrant further examination to understand these patterns (see recommendations in TOR 2).

The Panel accepted these data as presented.

TOR 2. Evaluate indices used in the assessment (e.g., indices of relative or absolute abundance, recruitment, state surveys, age-length data, etc.).

This TOR was Met.

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[1] NEFSC. 2024. Georges Bank haddock management track assessment report. Unpubl. rpt; 9 pp. Avail, NEFSC, 166 Water Street, Woods Hole, MA 02540

[2] Brooks, E.N, M.L. Traver, S.J. Sutherland, L. Van Eeckhaute, and L. Col. 2008. In. Northeast Fisheries Science Center. 2008. Assessment of 19 Northeast Groundfish Stocks through 2007: Report of the 3rd Groundfish Assessment Review Meeting (GARM III), Northeast Fisheries Science Center, Woods Hole, Massachusetts, August 4-8, 2008. US Dep Commer, NOAA Fisheries, Northeast Fish Sci Cent Ref Doc. 08-15; 884 p + xvii.http://www.nefsc.noaa.gov/publications/crd/crd0815/

Three surveys inform this assessment (NEFSC fall bottom trawl survey (BTS), NEFSC spring BTS, and the DFO BTS). As with the MT24 assessment for the stock, the Spring 2023 BTS was excluded because tows were only conducted in daylight and two strata were not sampled (both of which would bias the results).

Similarly, the appropriateness of including the fall 2025 BTS in the assessment was investigated. Survey sampling was considerably lower than previous years and extended much later in the year. Stratum contributions were also very different compared to recent years and the estimated CV is likely overly precise because some strata had a single tow and a variance could not be calculated for these strata. However, environmental conditions, and both the proportion and location of positive tows were similar to recent survey years, and dropping the terminal year survey could increase uncertainty and model instability. A robust array of analyses and diagnostics were examined for models that included or excluded the Fall BTS 2025 index value. Based on the model diagnostics (CVs, residuals, retrospective pattern, and self-tests) the Analyst recommended the survey be excluded from the assessment. The Panel concluded that this was a reasonable decision.

The Panel recommended additional research on density dependent growth for this stock. There are striking patterns of declining weight-at-age (WAA) for this stock in recent decades that do not appear solely explained by density, as spawning stock biomass (SSB) was high in the last decade, but the decline in WAA began well before this peak in biomass. In addition, the relative stability of growth at early periods of high abundance suggests that there is some interaction between density dependent and independent drivers (e.g., changing ocean conditions) in the recent period. Further research to understand drivers of WAA patterns, and relationship with size-at-age, maturity-at-age, and recruitment is recommended.

Time-varying selectivity patterns may interact with temporal changes in WAA. Additional research is needed to better characterize selectivity across seasons in the bottom trawl survey, as well as age-specific selectivity patterns, to improve understanding of these interactions and their implications for stock assessment.

The Panel made two Research Recommendations:

- Evaluate how density dependence, environmental change and other factors produce changes (as aliased through model parameters/inputs) in the GB haddock fishery independent data that informs the assessment (e.g., indices of relative abundance, recruitment, WAA, age-length data, etc.).
- Evaluate the effect of decreasing WAA on selectivity-at-age.

TOR 3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) as possible (depending on the assessment method) for the time series using the approved assessment method and estimate their uncertainty. Include retrospective analyses if possible (both historical and within-model) to allow a comparison with previous assessment results and projections, and to examine model fit.

a. Include bridge runs to sequentially document each change from the previously accepted model to the updated model proposed for this peer review.

b. Prepare a backup assessment approach that would serve as an alternative for providing scientific advice to management if the analytical assessment were to not pass review

This TOR was Met.

The WHAM model used for MT26 was the same as was used for MT24: age composition likelihood was treated as logistic normal, survey years with 0 catch were treated as missing, natural mortality was set to 0.2 for all years/ages, and process error transitions in NAA were modeled as autocorrelated by age and year (2DAR1). Therefore, no bridge run was necessary. As approved in the 2022 Research Track assessment for the stock, the backup plan is an empirical, index-based approach broadly known as *Ismooth*.

This TOR was the subject of the majority of the discussion by the Panel.

The Panel was concerned that the retrospective pattern in this assessment has strengthened over time, and although the Analyst suggested no retrospective adjustment is currently required, the Mohn's rho-adjusted point estimate is approaching the limit of the model's unadjusted 90% confidence interval. This suggests a strong and persistent retrospective pattern that may warrant correction in future assessments if the trend continues. The positive Mohn's rho indicates a tendency for the model to overestimate SSB and underestimate fishing mortality (F) in terminal years.

In addition, the model incorporates random effects on numbers-at-age (NAA), which can absorb process error. These random effects are predominantly negative in recent years, suggesting systematic adjustments to the model fit at the end of the time series. Further investigation is needed to evaluate the interaction between the NAA random effects and the retrospective pattern to determine how these processes jointly influence model scaling and terminal-year estimates.

The Panel was also concerned about the biological reality of the stability of SSB over the past 5 years while the survey indices, the NAA deviations (downward trends in 2-4 year olds) in terminal years continue to decline and the reliance on “paper fish” in out years.

Additionally, the Panel was interested in whether the difficulty of sampling smaller year classes when there are bumper year classes affects the model, and how changing WAA affects fleet selectivity patterns at age in the model.

Based on this discussion the Panel had several Research Recommendations:

- Continue investigating retrospective patterns and diagnostics in state-space models (e.g., consider the utility of tests other than the 90% CI for the necessity of Mohn's rho adjustments to SSB so as to balance impacts of changes in magnitude vs. statistical precision).
- Evaluate whether conditioning on the random effects is influencing the retro observed in self-tests (e.g., if there is a misspecification in the fleet selectivity then this could be carried forward to the self-tests resulting in the observed retro in the self-tests). An alternative structure of self-tests that doesn't condition on the primary sources of process variation (recruitment deviations, age-2+ NAA deviations, and fleet selectivity) could allow for more robust testing of the hypothesis that the model is unstable due to large year classes.
- Evaluate factors that could provide for the stability of SSB estimates in the face of the last 5 years of declining survey indices and NAA deviations. The NAA deviations act as "sponges" soaking up unaccounted for observation or process error (e.g., survivorship, selectivity, migration, unaccounted for catch). Continued work to diagnose the most likely drivers of patterns in NAA deviations could inform more robust projections.

TOR 4. Re-estimate or update the BRP's as defined by the management track level and recommend stock status. Also, provide qualitative descriptions of stock status based on simple indicators/metrics (e.g., age- and size-structure, temporal trends in population size or recruitment indices, etc.).

This TOR was Met.

Retrospective adjustments were not made to the model results. Spawning stock biomass (SSB) in 2025 was estimated to be 29,037 mt which is 109% of the biomass target (SSB_{MSY} proxy = 26,615). The 2025 average fishing mortality on ages 5-7 was estimated to be 0.21 which is 78% of the overfishing threshold proxy (F_{MSY} proxy = 0.27). The F_{MSY} proxy is expressed as the average F on ages 5-7.

The Panel accepted this TOR noting that the choice of median recruitment was highly influential on the reference points. The Panel concurred with the Analyst's stock status determination. Nonetheless the Panel provides the following Research Recommendation:

- Continued evaluation of appropriate methods for scaling recruitment in the calculation of reference points for this stock and development of dynamic biological reference points.

The Panel suggests the Analyst provide the dynamic reference points from WHAM for this stock. These would be informative given the substantial changes in WAA and selectivity for this stock.

Based on this Management Track Assessment, the recommended stock status is not overfished and overfishing is not occurring.

TOR 5. Conduct short-term stock projections when appropriate.

This TOR was Partially Met because projections beyond 2028 had such high uncertainty they were not deemed to be useful for management.

Short-term projections were conducted in WHAM, which propagates uncertainty in the processes of recruitment and transitions between numbers-at-age. For projection specifications, the NEFMC's Plan Development Team supplied an estimate of total catch for 2026, and fishing mortality was set equal to $F_{40\%SPR}$ for 2027-2031. Annual fishery selectivity and maturity were fixed at a recent 2 year average (2024-2025 values), following analyses and decisions made at the 2021 research track. Weights-at-age for catch and SSB that were predicted from a Gaussian Markov Random Field (GMRF) model, rather than a recent 2 year average, were preferred by the peer reviewers at the 2022 and 2024 management track assessment and were used in the projections submitted here for peer review.

The Panel was concerned about the high uncertainty in the terminal year of the assessment, the retrospective pattern for SSB and recruitment, and that years 3 and beyond relied largely on "paper fish". **As a result, the Panel concluded that while projections for 2027-28 were reasonable, projections beyond this had such high uncertainty as to not be useful for management.**

TOR 6. Respond to any review Panel comments or SSC concerns from the most recent prior research or management track assessment.

This TOR was Met however the Panel was concerned there was no response to additional Research Recommendations from the 2024 MT and SSC

The single previous research recommendation discussed was for studies to be conducted evaluating the gutted:whole fish conversion factors and length-weight ratio for commercial landings. A collaborative project between the NEFSC and GARFO was recently funded and is ongoing. Nearly 2 years of data have been collected, but some temporal/spatial gaps remain.

The Panel was concerned that all Research Recommendations from the SSC (4 RR) and 2024 MT peer review (3 RR) were not tabled in this review, While we are grateful that the Analyst provided responses to the SSC RR, we **suggest** that all future MT peer reviews address a complete list of recent Research Recommendations during the meeting.

The Analyst proposed that research continue investigating retrospective patterns and diagnostics in state-space models. The Panel agreed with these recommendations by the Analyst and included them in their list of Research Recommendations.

Additional Discussion – US and Canadian Georges Bank haddock assessments

The Analyst provided a comparison between the NMFS Georges Bank haddock and DFO's eastern Georges Bank assessments through 2024. The table contrasting the US

Georges Bank haddock WHAM and the Canadian DFO eastern Georges Bank haddock WHAM was highly useful, and the Panel recommended this be forwarded (with current result) to the US-Canada Transboundary Management Guidance Committee (TMGC) for their consideration and understanding of the differences between the two assessment models results. Presently the two WHAMs are similar but differ in several important aspects (e.g., the US model has process error on the numbers-at-age transitions and the Canadian model estimates an age-invariant natural mortality rate in the time block beginning in 2010; the Canadian model uses the DFO survey in recent years; The US model estimates recruitment as random deviations from a mean with the log normal adjustment off and the Canadian model estimates recruitment as fixed effects and projects recruitment as random samples from the historical distribution of recruitment estimates (mean and variance) with estimated autocorrelation) suggesting there could be some scaling differences introduced by the current models.

The comparison of SSB estimates from 2002-2021 of US and Canadian was highly informative, in that it indicated that the EGB assessment typically accounted for 50% or more of the stock size the US model estimated for the entire Bank.

The Panel suggested the Analysts continue to pursue characterization of differences in the GB/EGB models, as they provide multiple realizations of stock status and provide additional advice to managers for their decision making.

Research Recommendations from the Panel

The Panel recommended that between now and the next MT assessment, the NEFSC should:

1. Evaluate how density dependence, environmental change and other factors produce changes (as aliased through model parameters/inputs) in GB haddock indices used in the assessment (e.g., indices of relative or absolute abundance, recruitment, age-length data, etc.).
2. Evaluate the effect of decreasing WAA on selectivity-at-age.
3. Continue investigating retrospective patterns and diagnostics in state-space models (e.g., consider the utility of tests other than the 90% CI for the necessity of Mohn's rho adjustments to SSB so as to balance impacts of changes in magnitude vs. statistical precision)
4. Evaluate whether conditioning on the random effects is influencing the retro observed in self-tests (e.g., if there is a misspecification in the fleet selectivity then this could be carried forward to the self-tests resulting in the observed retro in the self-tests). An alternative structure of self-tests that doesn't condition on the primary sources of process variation (recruitment deviations, age-2+ NAA deviations, and fleet selectivity) could allow for more robust testing of the hypothesis that the model is unstable due to large year classes.
5. Evaluate factors that could provide for the stability of SSB estimates in the face of the last 5 years of declining survey indices and NAA deviations. The NAA deviations act as "sponges" soaking up unaccounted for observation or process

error (e.g., survivorship, selectivity, migration, unaccounted for catch). Continued work to diagnose the most likely drivers of patterns in NAA deviations could inform more robust projections.

6. Continue evaluation of appropriate methods for scaling recruitment in the calculation of reference points for this stock and development of dynamic biological reference points.
7. Continue to conduct studies to evaluate gutted:whole conversion factors and length-weight for commercial landings.
8. Continue to characterize differences in the separate Georges Bank and eastern Georges Bank WHAM models, such that their multiple realizations of stock status may provide additional advice to managers (TMGC) for their decision making.

Atlantic Herring

Summary

The Panel concluded that the 2026 assessment update for Atlantic herring is technically sufficient to evaluate stock status and provide scientific advice and meets most of the Terms of Reference for the stock's assessment except for TORs 5 which was partially met. The assessment represents Best Scientific Information Available (BSIA) for this stock for management purposes.

This 2026 assessment of the Atlantic herring (*Clupea harengus*) stock is the first application of the WHAM assessment platform following the 2025 research track assessment (NEFSC 2025)[3]. The last management track assessment was in 2024 and was conducted using the ASAP model[4].

This assessment updated fishery catch data, survey indices, and some life history parameters (e.g., weights-at-age), and the WHAM assessment model and reference points (BRPs) through 2025. Stock projections have been updated through 2031. Based on this assessment, the stock is overfished but overfishing is not occurring.

The change in assessment platforms from the 2024 management track makes comparisons with past assessments inappropriate. Several relatively minor changes have been made since the research track. A revised Canadian catch time series was used, a different approach was used for input effective sample sizes, and spawning stock biomass weight-at-age values were corrected.

TOR 1. Estimate catch from all sources including landings and discards.

This TOR was Met.

US and Canadian commercial discards, landings, and age composition were updated through 2025. US landings data were drawn from CAMS since 2020. Discards have only been available since 1996 but generally constitute <1% of landings. Note that the time series of Canadian landings has been revised since previous assessments.

While the Panel agreed the TOR was met there was concern regarding the Canadian catch data. First, the fixed gear (weir) catch data is of unknown quality (i.e., there is no estimate of variance and there is some evidence of misreporting). Secondly, there is an assumption that the only catch of the US stock in Canadian waters is in the fixed gear fishery, when it is likely there is also catch (of unknown scale) in the larger mobile gear (purse seine) fishery. Fish from the Canadian Atlantic herring stock may also be caught

[3] NEFSC. 2025. Atlantic herring research track assessment report. US Dept. of Commerce, NEFSC Tech Memo. 335; 91pp.

[4] NEFSC. 2024. Atlantic herring management track assessment report. Unpubl. rpt; 9 pp. Avail. NEFSC, 166 Water Street, Woods Hole, MA.

in the US fisheries. Underlying these concerns is a high uncertainty regarding mixing of US and Canadian herring fisheries and the extent to which these are mixed-stock fisheries.

Revisiting treatment of Canadian catch in this stock assessment could improve its quality. In particular, the stock identification information that underlies the assumption that these are US fish warrants an update to identify source population of these catches. Consequently, the Panel provided two Research Recommendations:

- Conduct sensitivity analysis to evaluate how different CVs (and perhaps misreporting) of the Canadian weir catch influence model estimates
- Develop estimates of the portion of catches in the fixed and mobile gear catches that come from the US and Canadian stocks.

TOR 2. Evaluate indices used in the assessment (e.g., indices of relative or absolute abundance, recruitment, state surveys, age-length data, etc.).

This TOR was Met

The four surveys currently used in the 2026 assessment model included the NEFSC Spring (1968-2025) and Fall (1963-2025) Bottom Trawl surveys (BTS), the Summer (Shrimp) survey (1980s-2023) and the Acoustic survey (1998-2025) conducted as part of the Fall BT survey. The former three surveys focus on the near-bottom distribution and abundance of herring, while the latter quantifies fish throughout the water column.

These surveys have shown consistent cohort tracking even as they have declined since 2009, reflecting broader declines in abundance. They drive the indices necessary for the assessment - age composition, abundance, and spatial distribution.

The Panel was concerned that none of the current trawl surveys provide data on age-1 abundance, which is problematic for such a short-lived stock. Not incorporating the ME-NH survey (which samples small herring better than the NEFSC bottom trawl surveys) or the seabird diet index contributes to the loss of this information.

There was also concern that there may have been shifts in distribution. Comments from the Community Engagement session and Industry testimony in this review indicated that herring are being caught at different times, in different areas, in deeper water, and in smaller aggregations. All of this suggests the potential for time-varying catchability that could introduce sampling bias in the trawl surveys between years.

The Panel Recommended the following actions:

- Continue work on the development of the VAST model to integrate state and federal surveys particularly with respect to use of surveys that include information on age-1 fish (ME-NH survey). Development of model-based indices for this stock could also address potential for time varying catchability.

- Continue exploring use of the seabird diet data as an index of age-1 abundance (the Panel acknowledges the preceding RR is a more fruitful use of Analyst's time)
- Continue exploration of survey data to determine whether Atlantic herring distribution has changed

The Panel considered the first of these Recommendations to be a priority to address before the next Management Track assessment.

TOR 3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) as possible (depending on the assessment method) for the time series using the approved assessment method and estimate their uncertainty. Include retrospective analyses if possible (both historical and within-model) to allow a comparison with previous assessment results and projections, and to examine model fit.

> **a. Include bridge runs to sequentially document each change from the previously accepted model to the updated model proposed for this peer review.**
>
> **b. Prepare a backup assessment approach that would serve as an alternative for providing scientific advice to management if the analytical assessment were to not pass review**

This TOR was Met but the underlying patterns in the NAA random effects require further investigation to improve attribution of process error and that the structural assumptions (e.g., no correlation across years) be revisited before the next MT assessment.

The Panel recognized that continued poor recruitment and negative numbers-at-age random effects (e.g., poor survival) in recent years is the main issue driving stock abundance. The challenge in attributing the process that is being accounted for in NAA deviations undermined confidence in the results of the model regarding current abundance and projections. The high CV on recruitment and results of self-test indicate high uncertainty in estimates.

Key concerns are the pattern observed in the numbers-at-age (NAA) random effects (i.e., strong correlation among ages) and lack of support for a correlation among years. The unusual highly correlated negative NAAs for ages 2-7 could be related to the spike in recruitment in 2019 identified by WHAM, which was not present in the 2024 MT assessment in ASAP. The Panel discussed that these NAA deviations could be artefacts that are highly influential on scaling of population estimates and may warrant re-evaluation. Specifically the underlying annual variability shown in the NAA deviations suggest there could be a covariate being aliased that has a significant effect on interannual patterns of the NAA deviations or that a signal in the input data (e.g., age-composition data or survey index data) is leading to strong annual signal that is lost in

subsequent years. This uncertainty is compounded by the recent gaps in data due to missing Spring 2023 BTS data and 2024-2025 shrimp surveys, on top of recent changes in the catch reporting (switch to CAMS) and the sparse port sampling of weight-at-age. These gaps contribute to the challenge of not being able to attribute the negative NAA deviations to a process. The 2025 RT had similar concerns and the Panel hopes to see progress on the treatment of NAAs after this MT assessment.

The Panel recommends that in the future Analysts revisit the assumption of no temporal autocorrelation in recruitment deviations across years. Because the projected population dynamics are sensitive to these assumptions, revisiting the treatment of NAA random effects and the temporal structure of recruitment as additional data are added to the assessment could have substantial implications for stock assessment results and projections. Currently, the panel discussed that this uncertainty could lead to issues with scaling of population abundance in the assessment (TOR4) and in projections (TOR5).

More work is needed to correctly attribute the uncertainty that is being captured by the NAA process error. Consequently, the Panel provided a second Major Research Recommendation for herring to address before the next Management Track assessment:

- Investigate the potential for autocorrelation in annual recruitment, as well as explore covariate(s) aliased in the NAA random effects and determine which is having the most effect on interannual patterns. Further exploration of the possible drivers of process error patterns in numbers-at-age random effects that suggest poor survival across ages.

The Panel understands from the Analyst that exploring longer lags is currently not available in WHAM; nonetheless, this remains an issue with assessment which ultimately needs to be addressed.

TOR 4. Re-estimate or update the BRP's as defined by the management track level and recommend stock status. Also, provide qualitative descriptions of stock status based on simple indicators/metrics (e.g., age- and size-structure, temporal trends in population size or recruitment indices, etc.).

This TOR was Met

Retrospective adjustments were not necessary (SSB Mohn's rho = 0.22 and F Mohn's rho = -0.04). Spawning stock biomass (SSB) in 2025 was estimated to be 35,258 (mt) which is 19% of the biomass target (SSB_{MSY} proxy = 188,214). The 2025 average mobile fleet fishing mortality for ages 7-8 (fully selected) was estimated to be 0.121 which is 44% of the overfishing threshold proxy (F_{MSY} proxy = 0.272).

Reference points were calculated using the spawning potential ratio (SPR) 40% proxy approach, with $F_{40\%}$ used as a proxy for F_{MSY} and $SSB_{F40\%}$ as a proxy for SSB_{MSY}. A key concern is the scaling of these reference points for herring, particularly the recruitment assumptions underlying the estimation. It is unclear whether the resulting SSB_{MSY} proxy

appropriately reflects the stock's productivity and whether $F_{40\%}$ remains a good proxy for F_{MSY} given the evidence for a regime change for many of the stocks in this region.

The Panel highlighted that decisions made in model fitting (TOR 3) have large implications for reference points. Prevailing conditions are negative in recent years for herring, as indicated by negative NAA deviations and recruitment deviations, but with no year effect selected for in the model this means these conditions do not propagate into reference point calculations. While this is consistent with decisions made at the research track, this may not be representative of prevailing conditions for this stock.

Though the Panel accepted the Analyst's results, they provided the following Research Recommendations:

- Investigate dynamic reference points for Atlantic herring, including work on fitting dynamic stock-recruit relationships, alternative specification of random effects or inclusion of covariates in the model, or short-term approaches to revise recruitment assumptions (e.g., truncation of time series).
- Reconsider the appropriateness of $F_{40\%}$ for an F% more responsive to the changes in productivity that herring are experiencing.

Note that this recommendation may apply to a number of assessed stocks using the default $F_{40\%}$ proxy.

Based on this Management Track Assessment, the recommended stock status is overfished but overfishing is not occurring.

TOR 5. Conduct short-term stock projections when appropriate.

This TOR was Partially Met as the Panel considered the OFLs (or F_{msy}) and ABC projections based on the RT methodology to be useful but likely to be overly optimistic especially in light of the sensitivity analyses

The projection results applied the harvest (ABC) control rule described in Amendment 8 of the herring Fishery Management Plan to the mobile fleet. The fixed gear catches are assumed constant during the projection period and equaled 5,283 mt/year. This fixed gear catch equals the sum of the ten year (2016-2025) averages of the Canadian (5,130 mt) and US (152 mt) fixed gear catches. The US fixed gear includes catches from stop seines, weirs, and pound nets. The reported F_{7-8} are averaged over ages 7-8, which are fully selected by the mobile fleet (trawls and purse seine) fleet. Projected recruitment continued the independent and identically distributed process estimated by WHAM. NAA random effects were not carried forward into the projection period due to lack of an autocorrelation across years in the model.

These projections indicate rapid increases in SSB and catch given the reduction in fishing with the application of the control rule. This pattern is driven by several factors, including the use of the geometric mean recruitment of the full time series and the absence of autocorrelation across years, such that recent negative NAA deviations and

recruitment deviations do not inform projections. Both the RT Panel and this MT Panel believe the SSB estimates and catch projections are likely overestimated.

Estimated negative random effects on numbers-at-age (NAA), which represent additional fish losses beyond those accounted for by fishing and natural mortality, are not assumed to be autocorrelated across years and do not continue into the projection period. As a result, recent cohorts experience higher projected survival than is evident in WHAM outputs and thus contribute substantially to future SSB in the projections.

This TOR was particularly affected by the structure of the NAA random effects expressed under TOR 3. The Analyst presented a sensitivity analysis using the average of the NAA deviations estimated for the most recent 5 years that provided an alternative scenario with significant impact on projections. The Panel saw this analysis as useful and agreed both projections should be provided for management decisions. The Panel considered the OFLs (or F_{msy}) and ABC projections based on the RT methodology likely to be overly optimistic especially in light of the sensitivity analysis which better reflects prevailing conditions for the NAA deviations. The Panel also noted issues with the approach used in the sensitivity analysis (e.g., not consistent with the model, the 5-year average of the NAA deviations does not propagate the high interannual variability in the deviations). **After considerable discussion, the Panel concluded that the PDT and SSC should view the projections and sensitivity analysis as context for catch advice setting but that each has challenges that limit their utility.**

The Panel provided the following Research Recommendations:

- Revisit decisions on random effects (TOR 3) as additional years of data are added as model diagnostics may support alternative configurations as new information is added.
- Revisit use of the geometric mean recruitment of the full time series to inform projections, rather than more recent conditions.

TOR 6. Respond to any review Panel comments or SSC concerns from the most recent prior research or management track assessment.

This TOR was Met.

The Analyst reviewed the status of a dozen Research Recommendations from the 2025 Atlantic herring Research Track. Little progress had been made to date in part because of the short time since the RT was concluded but also because of the lack of resources to conduct the research. The Panel encourages the NEFSC to continue working on these items.

The Analyst also reviewed and responded to comments provided as part of the 2025 Community engagement session on Atlantic herring. Issues raised there included changes in herring migration timing, interactions between the distribution/abundance of menhaden, mackerel, and herring, herring stock structure and the treatment of

Canadian catches. Again research for many of these topics was in progress. The Panel commended the Analyst for bringing these items forward in the peer review.

Additional Discussion - Public Comments

The Panel received public comments from six representatives of the herring fishing fleet. Industry concerns about the status of the Atlantic herring stock and this assessment generally focused on changes in the distribution of herring and the impact that a further reduction in the catch advice would have on industry. With respect to the former, commenters felt that herring had moved deeper offshore (but lots of small fish inshore) and may not have been accessible to the NEFSC BT survey as in previous year's surveys. The second set of comments on the impact of the assessment suggested the reduced catch advice that would arise from the assessment's proposed 2027 OFL/ABC would severely limit fleet activities. At least two of the speakers suggested that the SSC consider averaging catch advice over the five projection years.

A full description of the comments are provided to the NEFSC via the rapporteurs' notes.

Research Recommendations from the Panel

The Panel recommended that between now and the next MT assessment, the NEFSC should:

1. Conduct sensitivity analysis to evaluate how different CVs (and perhaps misreporting) of the Canadian weir catch influence model estimates
2. Develop estimates of the portion of catches in the fixed and mobile gears catches that come from the US and Canadian stocks
3. Continue work on the development of the VAST model to integrate state and federal surveys particularly with respect to use of surveys that include information on age-1 fish (ME-NH survey). Development of model-based indices for this stock could also address potential for time varying catchability.
4. Continue exploring use of the seabird diet data as an index of age-1 abundance (the Panel acknowledges that RR3 is a more fruitful use of Analyst's time)
5. Continue exploration of survey data to determine whether Atlantic herring distribution has changed
6. Investigate the potential for autocorrelation in annual recruitment, as well as explore covariate(s) aliased in the NAA random effects and determine which is having the most effect on interannual patterns.
7. Investigate dynamic reference points for Atlantic herring, including work on fitting dynamic stock-recruit relationships, alternative specification of random effects or inclusion of covariates in model, or short-term approaches to revise recruitment assumptions (e.g., truncation of time series)
8. Reconsider the appropriateness of $F_{40\%}$ for an F% more responsive to the changes in productivity that herring are experiencing.

9. Revisit decisions on random effects (TOR 3) as additional years of data are added as model diagnostics may support alternative configurations as new information is added.
10. Revisit use of the geometric mean recruitment of the full time series to inform projections, rather than more recent conditions.

Recommendations 3, and 6 were considered by the Panel to be the most important and should be addressed prior to the next Management Track assessment for the stock.

Additionally, the Panel suggested this stock be prioritized for consideration in the upcoming Research Track on projection methodologies.

Appendix A.

Management Track Assessment Terms of Reference

1. Estimate catch from all sources including landings and discards.

2. Evaluate indices used in the assessment (e.g., indices of relative or absolute abundance, recruitment, state surveys, age-length data, etc.).

3. Estimate annual fishing mortality, recruitment, and stock biomass (both total and spawning stock) as possible (depending on the assessment method) for the time series using the approved assessment method and estimate their uncertainty. Include retrospective analyses if possible (both historical and within-model) to allow a comparison with previous assessment results and projections, and to examine model fit.

    a. Include bridge runs to sequentially document each change from the previously accepted model to the updated model proposed for this peer review.

    b. Prepare a backup assessment approach that would serve as an alternative for providing scientific advice to management if the analytical assessment were to not pass review.

4. Re-estimate or update the BRP's as defined by the management track level and recommend stock status. Also, provide qualitative descriptions of stock status based on simple indicators/metrics (e.g., age- and size-structure, temporal trends in population size or recruitment indices, etc.).

5. Conduct short-term stock projections when appropriate.

6. Respond to any review Panel comments or SSC concerns from the most recent prior research or management track assessment.

Appendix B.

June Management Track Peer Review Meeting Attendance
June 29-30, 2026

ASMFC - Atlantic States Marine Fisheries Commission
GARFO - Greater Atlantic Regional Fisheries Office
MAFMC - Mid-Atlantic Fisheries Management Council
NEFMC - New England Fisheries Management Council
NEFSC - Northeast Fisheries Science Center

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Richard Merrick - Chair, NOAA Fisheries (retired), NEFMC Scientific and Statistical Committee
Tim Barrett - Panel, Fisheries and Oceans Canada, ASFMC appointee
Lisa Kerr - Panel, University of Maine, NEFMC Scientific and Statistical Committee
Holly Kindsvater - Panel, Virginia Polytechnic Institute and State University, MAFMC Scientific and Statistical Committee

Larry Alade, NEFSC
Melanie Barrett, Fisheries and Oceans Canada
David Benson
Kristan Blackhart, NEFSC
Jessica Blaylock, NEFSC
Jason Boucher, NEFSC
Emily Bodell, NEFMC
Bonnie Brady, New England Fishermen’s Stewardship Association
Liz Brooks, NEFSC
Carly Burns, NOAA Affiliate
Steve Cadrin, University of Massachusetts Dartmouth
Patrick Campfield, ASMFC
Jui-Han Chang, NEFSC
Ethan Chase, fisherman
Matt Cieri, Maine Department of Marine Resources
Jamie Cournane, NEFMC
Kiersten Curti, NEFSC
Jess Daniels, New England Fish Company
Micah Dean, Massachusetts Division of Marine Fisheries
Dustin Delano, fisherman
Jonathan Deroba, NEFSC
Jason Didden, MAFMC
Tara Dolan, Massachusetts Division of Marine Fisheries
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Alex Dunn, NEFMC
Corrin Flora, North Carolina Division of Marine Fisheries
Robin Frede, NEFMC
Mark Grant, NEFMC
Melanie Griffin, Massachusetts Division of Marine Fisheries
Alex Hansell, NEFSC
Amanda Hart, NEFSC
Daniel Hennen, NEFSC
Nathan Hebert, Fisheries and Oceans Canada
Daniel Hocking, GARFO
Cameron Hodgdon, NEFSC
Brian Hooper, NEFSC
Andrew Joyce, F/V Providian
Jeff Kaelin, Lund's Fisheries
Raymond Kane, Cape Cod Fishermen's Alliance
Rick Kasten
Zack Klyver, NEFMC Atlantic Herring Advisory Panel
Chris Legault, NEFSC
Brian Linton, NEFSC
Andy Lipsky, NEFSC
Bill Lucy, Long Island Soundkeeper
Declan McCormick, Maine Department of Marine Resources
Kathryn MacDonald, Fisheries and Oceans Canada
Mitch McDonald, NOAA Office of General Counsel
Tara McIntyre, Fisheries and Oceans Canada
Conor McManus, NEFSC
Timothy Miller, NEFSC
Allison Murphy, GARFO
Paul Nitschke, NEFSC
Carrie Nordeen, GARFO
Jackie O'Dell, Northeast Seafood Coalition
Cate O'Keefe, NEFMC
Danilee Palmer, GARFO
Charles Perretti, NEFSC
Michelle Raber, F/V Providian
Suzannah Raber, F/V Providian
Ryan Raber, Ocean Spray
Marianne Randell, GARFO
Kaitlin Rogers, NEFSC
Elizabeth Roros, University of Massachusetts Dartmouth
Melissa Smith, Maine Department of Marine Resources
Liz Sullivan, GARFO
Spencer Talmage, GARFO
Mary Beth Tooley, O'Hara Corporation
Samuel Truesdell, NEFSC
Kaitlynn Wade, University of North Carolina

Megan Ware, Maine Department of Marine Resources
Peter Whelan, fisherman
Kelly Whitmore, Massachusetts Division of Marine Fisheries
Antony Wood, NEFSC

Appendix C.

June 2026 Management Track Peer Review Agenda

**All times are approximate and may be changed at the discretion of the Peer Review Panel chair. The meeting is open to the public.*

Monday, June 29, 2026

Time	Stock	Subject	Presenter
9:00 a.m.		Welcome/Logistics Conduct of Meeting	Brian Hooper Kristan Blackhart Panel Chair
9:15 a.m.	Georges Bank Haddock	Terms of Reference (TOR) Review & Panel Questions	Liz Brooks Panel
10:30 a.m.		***Break***	
10:45 a.m.	Georges Bank Haddock	TOR Review & Panel Questions, continued	
11:45 a.m.	Georges Bank Haddock	Public Comment	Public
12:00 p.m.		***Lunch***	
1:00 p.m.	Georges Bank Haddock	Panel Deliberations	Panel
2:15 p.m.	Georges Bank Haddock	Panel Conclusions / Recommendations and Final Stock Wrap Up	Panel
3:00 p.m.		Closed Panel Writing Session	
5:00 p.m.		***Adjourn***	

Tuesday, June 30, 2026

Time	Stock	Subject	Presenter
9:00 a.m.		Welcome/Logistics	Brian Hooper Panel Chair
9:05 a.m.	Atlantic Herring	TOR Review & Panel Questions	Jonathan Deroba Panel
10:30 a.m.	Atlantic Herring	Public Comment	Public
10:45 a.m.		***Break***	
11:00 a.m.	Atlantic Herring	Panel Deliberations	Panel
11:30 a.m.	Atlantic Herring	Panel Conclusions / Recommendations and Final Stock Wrap Up	Panel
12:00 p.m.		***Lunch***	
1:00 p.m.	All stocks	Final Meeting Wrap Up, if needed (else closed Panel writing session)	Panel
3:00 p.m.		Closed Panel Writing Session	
5:00 p.m.		***Adjourn***	

Appendix D.

Acronyms Used in This Report

ABC - acceptable biological catch
ASAP - Age Structured Assessment Program
AWG - Assessment Working Group
BLLS - Bottom Long Line Survey
BRP - biological reference point
BTS - bottom trawl survey
CAMS - Catch Accounting and Monitoring System
CI - confidence interval
CV - coefficient of variation
DFO - (Department of) Fisheries and Oceans Canada
EGB - eastern Georges Bank
F - Fishing mortality
GARFO - Greater Atlantic Regional Fisheries Office
GB - Georges Bank
GMRF - Gaussian Markov Random Field
M - natural mortality
ME - Maine
MT - Management Track
NAA - numbers-at-age
NEFSC - Northeast Fisheries Science Center
NEFMC - New England Fishery Management Council
NH - New Hampshire
NRCC - Northeast Region Coordinating Council
OFL - Overfishing Limit
PDT - Plan Development Team
RE - random effects
RR - research recommendation
RT - Research Track
RTSC - Research Track Steering Committee
SSB - spawning stock biomass
SSC - Scientific and Statistical Committee
SSRT - State Space Research Track
TMGC - Transboundary Management Guidance Committee
USGS - United States Geological Survey
VAST - Vector Autoregressive Spatio-Temporal
WAA - weight-at-age
WHAM - Woods Hole Assessment Model

draft working paper for peer review only

Atlantic Herring

2026 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 06-05-2026

This assessment of the Atlantic Herring (Clupea harengus) stock is a management track assessment, and is the first application of the WHAM assessment platform following the 2025 research track assessment (NEFSC 2025). The last management track assessment was in 2024 and was conducted using the ASAP model. Based on that 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 WHAM assessment model and reference points (BRPs) through 2025. The change in assessment platforms from the 2024 management track makes comparisons among the assessments inappropriate. Several relatively minor changes have been made since the resarch track. Namely, a revised Canadian catch time series was used, a different approach was used for input effective sample sizes, and spawning stock biomass weight-at-age values were corrected.

State of Stock: Based on this management track assessment, the Atlantic Herring stock is overfished and overfishing is not occurring (Figures 1-2). Retrospective adjustments were not necessary (SSB Mohn's rho = 0.22 and F Mohn's rho = -0.04). Spawning stock biomass (SSB) in 2025 was estimated to be 35,258 (mt) which is 19% of the biomass target (SSB_{MSY} *proxy* = 188,214; Figure 1). The 2025 average, mobile fleet, fishing mortality for ages 7-8 (fully selected) was estimated to be 0.121 which is 44% of the overfishing threshold proxy (F_{MSY} *proxy* = 0.272; 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, mobile fleet, fishing mortality on ages 7 to 8, which are fully selected. Model results are from the current WHAM assessment and no adjustment for retrospective pattern was necessary.

	2018	2019	2020	2021	2022	2023	2024	2025
				Data				
US Catch	45,527	12,792	9,864	5,210	4,239	10,165	10,447	3,265
Canadian Catch	13,426	6,496	6,965	4,877	4,347	1,960	2,965	3,884
Total Catch	58,953	19,289	16,829	10,087	8,586	12,125	13,412	7,149
				Model Results				
Spawning Stock Biomass	21,075	56,484	36,912	36,983	85,973	79,843	47,877	35,258
$\bar{F}_{7-8}$	1.656	0.4	0.445	0.199	0.109	0.222	0.315	0.121
recruits (age1)	559,391	4,457,469	2,278,256	799,145	706,515	743,734	456,155	1,966,904

Table 2: Reference points from the 2024 ASAP assessment and the current WHAM assessment are incomparable and are provided for information only. A fleet specific, mobile fleet $F_{40\%}$ proxy was used for the overfishing threshold, and the biomass proxy reference point was estimated using the mean of the recruitment process. 90% CI were reported in parentheses.

	2024	2026
F_{MSY} *proxy*	0.45	0.272
SSB_{MSY} (mt)	186,367 (95,900 - 340,000)	188,214 (123,672 - 286,439)
MSY mt	78,710 (45,000 - 128,800)	55,211 (35747 - 85273)
Median recruits (age 1)	2,493,500 (485,400 - 9,107,300)	2,324,046
Overfishing	No	No
Overfished	Yes	Yes

Projections: 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 5,283 mt. This fixed gear catch equals the sum of the ten year (2016-2025) averages of the Canadian (5,130 mt) and US (152 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. Projected recruitment continued the independent and identically distributed process estimated by WHAM. NAA random effects did not persist into the projection period.

Table 3: Projection results.

Year	Catch mt	SSB (mt)	$\bar{F}_{7-8}$
2026	13,165	26,102	0.383

Year	Catch mt	SSB (mt)	$\bar{F}_{7-8}$
2027	6,222	77,841	0.021
2028	18,297	140,644	0.171
2029	27,637	184,357	0.218
2030	32,854	214,543	0.218
2031	38,169	235,978	0.218

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. The research track assessment explored several hypotheses to explain poor recruitment but no definitive answer was reached. The numbers-at-age random effects in this assessment also imply that abundance of older herring is declining at rates faster than fishing and natural mortality alone would suggest. Like recruitment, no definitive explanation is available. Another uncertainty in this assessment is natural mortality. In this assessment, natural mortality was assumed constant among ages and years. The research track assessment explored several options for time- and age-varying natural mortality, but available data did not support such a change. Stock structure, particularly mixing with Nova Scotian or Bay of Funday herring, is also an uncertainty, but data to inform migration and mixing rates are unavailable.

- 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 minor and no adjustments were required.

- 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 and the treatment of numbers-at-age random effects. The data do not currently support autocorrelated recruitment even though recent recruitment has been consistently poor. The projections effectively assume an immediate return to mean recruitment, and if this is not realized, the projections are likely to be overly optimistic. Likewise, the data do not support temporal autocorrelation in the numbers-at-age random effects either, but there seems to be a long-term, negative trend. Numbers-at-age random effects do not continue into the projection period, but if they remain negative in the future, the projections will be overly optimistic. The projections updated for this management track confirm that the projections done for the research track were overly optimistic. The stock is currently in a rebuilding schedule, but that schedule was developed using previous assessments completed in the ASAP model. The methods for reference points and projections in the WHAM model are not comparable to those from ASAP, making a comparison of these projections to the existing rebuilding plan inappropriate.

- 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.

  Since the previous management track, this assessment transitioned from ASAP to WHAM. While WHAM differs in many ways from ASAP, the general conclusions about reduced productivity (e.g., poor recruitment) and stock status were unaffected. In addition to a switch to WHAM, a revised Canadian catch time series was used, a different approach was used for input effective sample sizes, and spawning stock biomass weight-at-age values were corrected. None of these changes had significant impacts on estimated quantities or stock status.

- 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 and negative numbers-at-age random effects (e.g., poor survival) in recent years 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.

  The research track assessment explored several explanations for poor recruitment, and while no definitive answer was reached, continued consideration of various hypotheses (e.g., haddock predation on herring eggs, copepod abundance, temperature) is warranted. Terminal year recruitment estimates are likely to be over estimated without an index of age-1 abundance (or under estimated should recruitment be above average). An age-1 index based on bird diet has been developed, but several challenges remain before it can be included. State (ME/NH, MA) surveys catch age-1 herring, and combining those surveys with NMFS bottom trawl data may be worthwhile. Work to improve projections and address consistently overly optimistic results would be generally beneficial. In particular, studies that quantify projection accurarcy and how to treat recruitment and NAA random effects in the projection period would be highly informative.

- Are there other important issues?

  No other important issues were identified.

References:

NEFSC (Northeast Fisheries Science Center) . 2025. Atlantic herring research track assessment report. US Dept. of Commerce, NEFSC Tech Memo. 335; 91p.

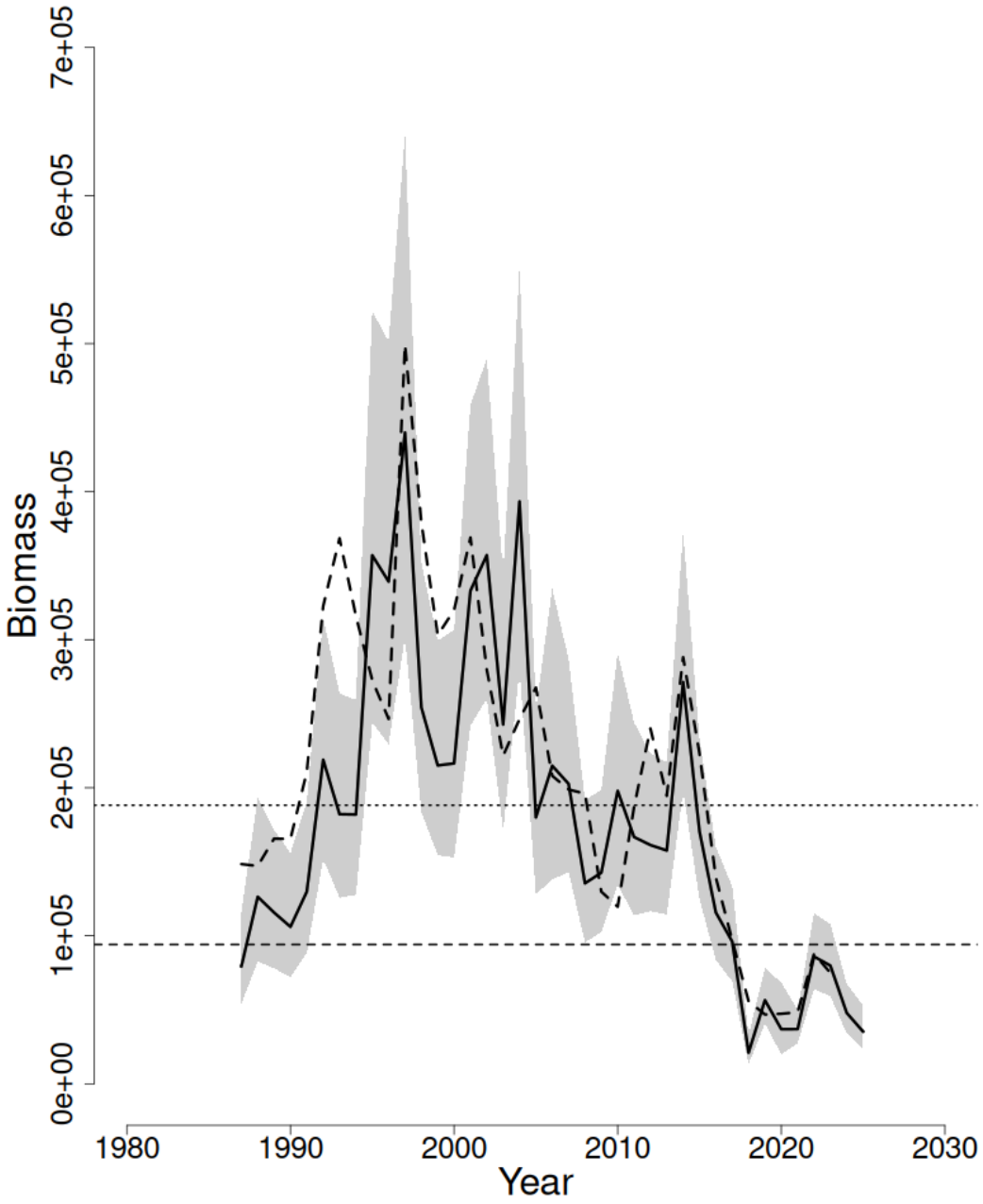

Figure 1: Trends in spawning stock biomass of Atlantic Herring between 1987 and 2025 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{Threshold}$ ($\frac{1}{2}$ SSB_{MSY} *proxy*; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} *proxy*; horizontal dotted line) based on the 2026 assessment. The approximate 90% confidence intervals are shown.

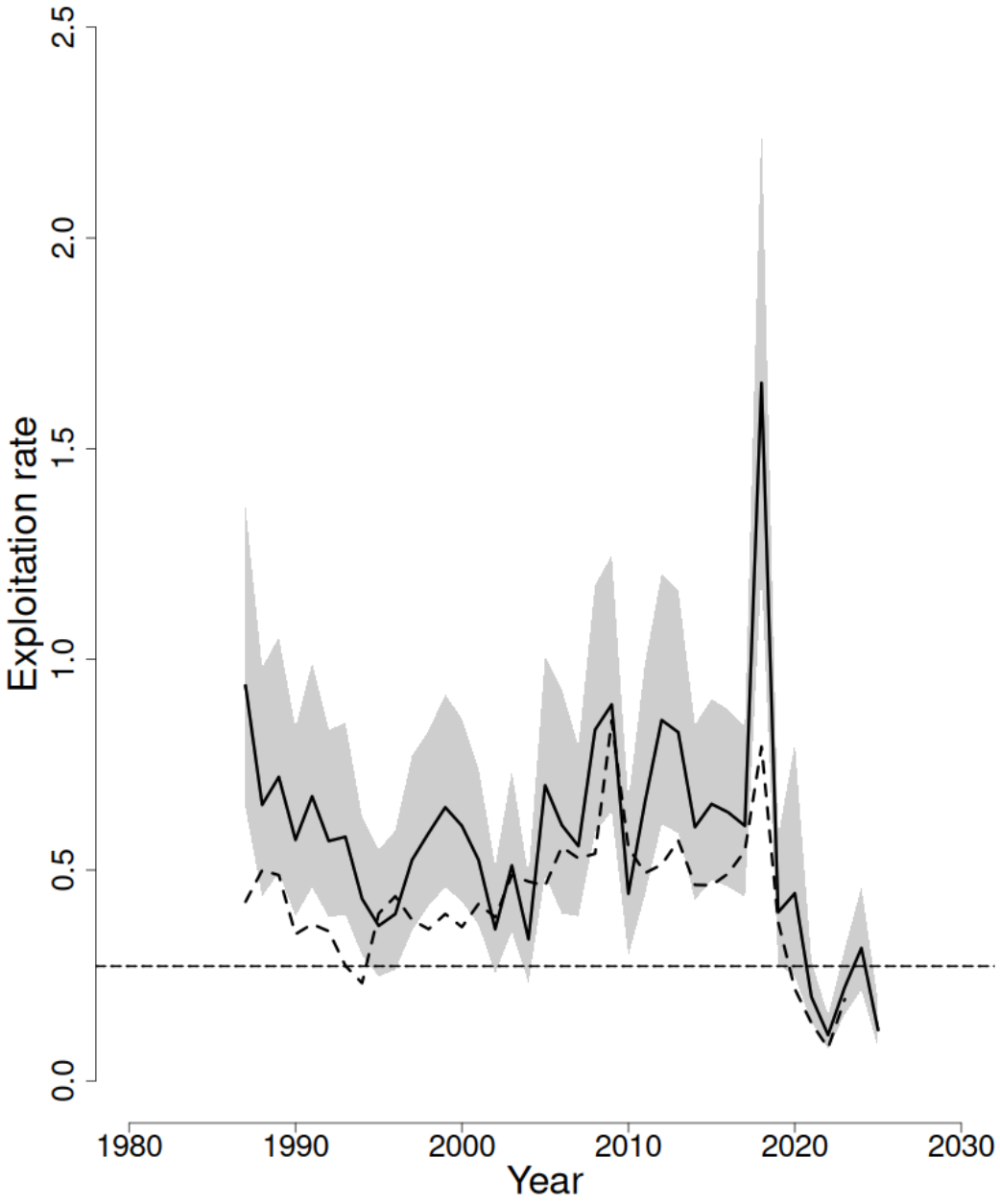

Figure 2: Trends in the average fishing mortality rate for ages 7-8, which are fully selected by the mobile fleet ($\bar{F}_{7-8}$), between 1987 and 2025 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{Threshold}$ (F_{MSY} *proxy*=0.272; horizontal dashed line). The approximate 90% confidence intervals are shown.

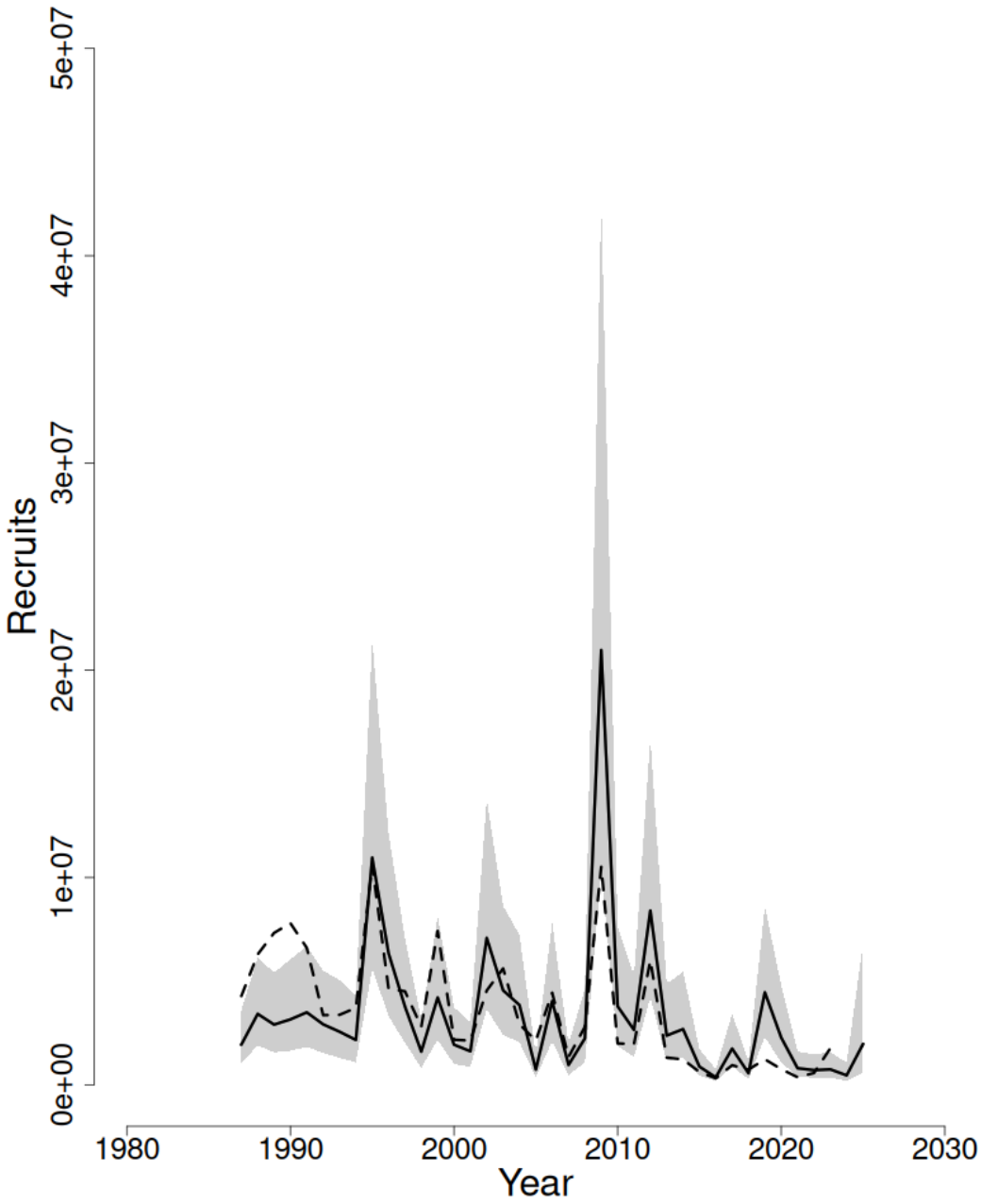

Figure 3: Trends in recruits (age-1)(000s) of Atlantic Herring between 1987 and 2025 from the current (solid line) and previous (dashed line) assessment. The approximate 90% confidence intervals are shown.

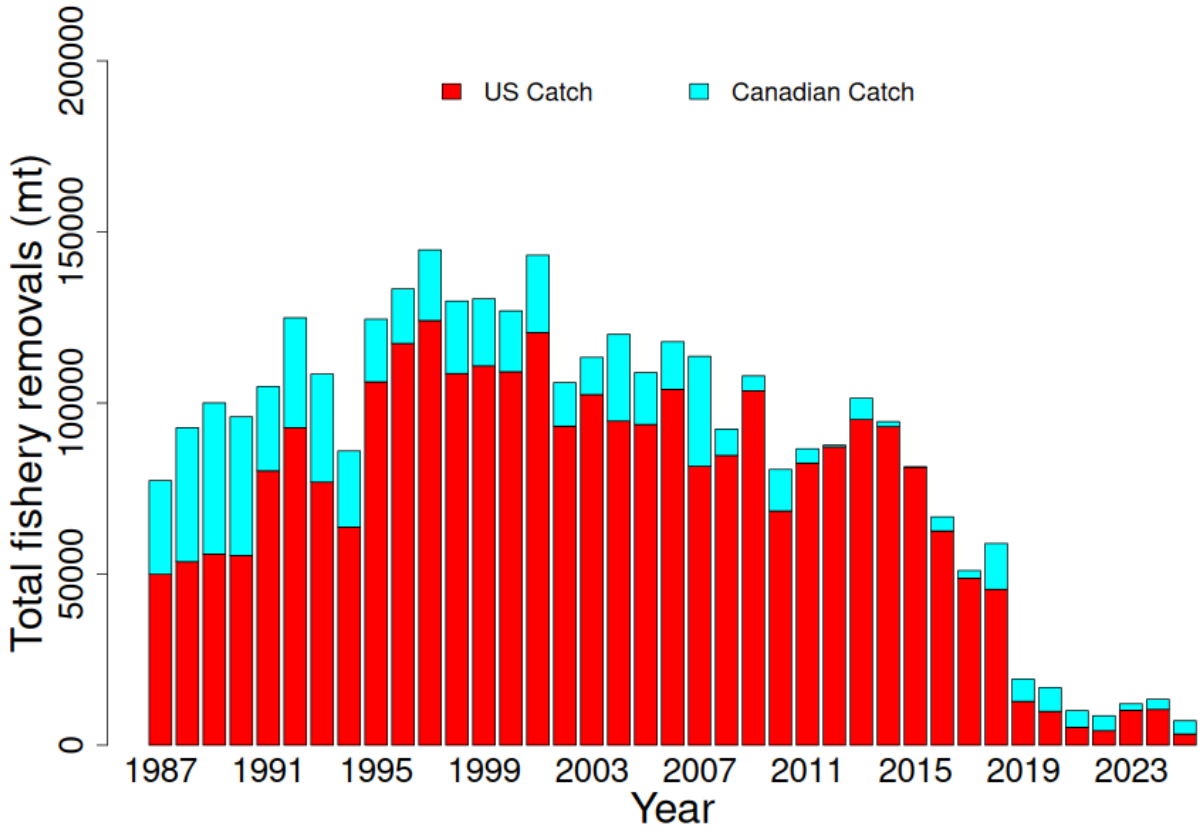

Figure 4: Total catch of Atlantic Herring between 1987 and 2025 by US and Canadian fleets.

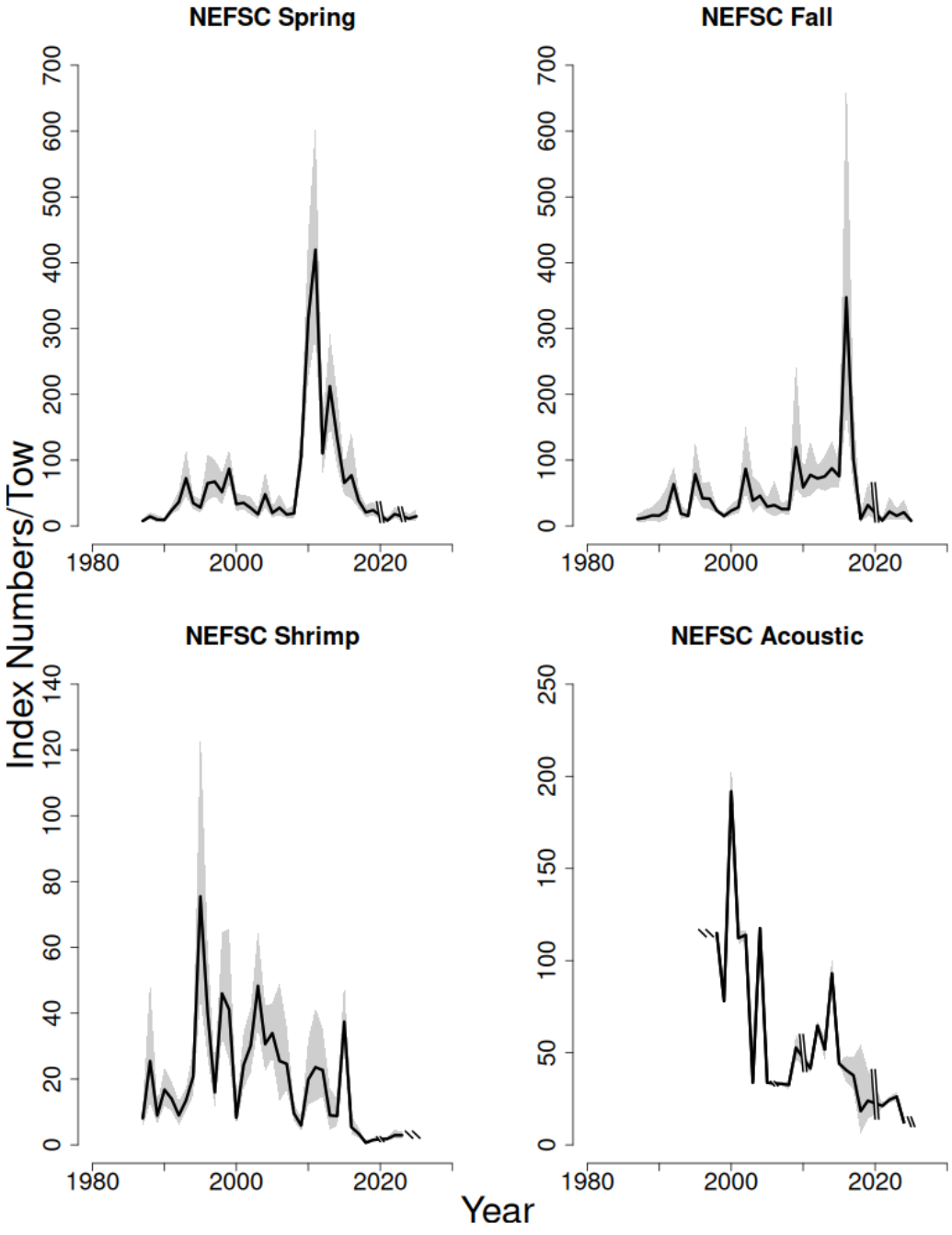

Figure 5: Indices of abundance for Atlantic Herring between 1987 and 2025 for the Northeast Fisheries Science Center (NEFSC) spring, fall, and shrimp bottom trawl surveys. The NEFSC acoustic index is collected during the fall bottom trawl survey and is in units of acoustic backscatter, not absolute numbers. The approximate 90% confidence intervals are shown.