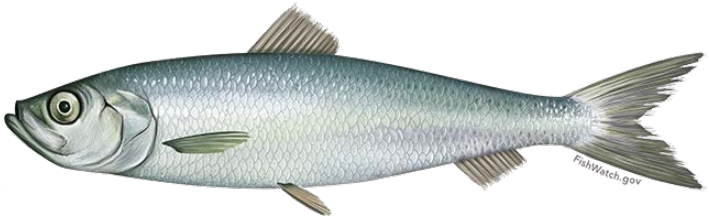
Atlantic Herring Fishery Management Plan

Management Strategy Evaluation Debrief Final Report



Prepared by the

New England Fishery Management Council

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TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

This report summarizes input on the process used by the New England Fishery Management Council (Council) to develop acceptable biological catch control rule alternatives for the Atlantic herring fishery using Management Strategy Evaluation (MSE). The MSE used in Amendment 8 to the Atlantic herring plan was the first MSE in this region; therefore, the Council decided to take this opportunity to pause and reflect on the process used to help inform future Council decisions. Input has been gathered from Council members, the Herring Advisory Panel (AP) and Plan Development Team (PDT), and the public.

Atlantic herring fishery management is relatively controversial with passionate stakeholders from numerous backgrounds. Atlantic herring is an important commercial fishery that has been part of the New England fishing community culture for centuries. This species is also a principal forage fish in the region, which draws additional stakeholders into the process that are interested in the conservation of this resource for its predators. In addition, the science available to inform this management plan is uncertain; several key aspects of stock structure and distribution are data limited. For these reasons, some commenters felt conducting an MSE was premature for herring and would not be as effective compared to a plan with more certain science and less diverse stakeholders. However, others felt that Atlantic herring was a perfect candidate for MSE for those same reasons so that various uncertainties and tradeoffs could be described and evaluated.

Stakeholder engagement is critical in fisheries management but including many participants can be challenging and often takes more time to effectively engage and synthesize input from multiple user groups. This MSE process used completely open-invitation workshops to solicit input on the objectives and alternatives developed and analyzed. It is still unclear if this was the most effective approach; input was mixed. Many commenters said that a hybrid of open-invitation workshops and more focused work group meetings may be a fruitful approach to try in the future.

Across the board, commenters said that this MSE process was rushed, especially the latter stages. This was a new process for this region and participants needed more time to digest the models, understand the results, and consider the various impacts. A major challenge for using MSE in Amendment 8 was that the official estimate of herring biomass completely switched from relatively high to relatively low levels towards the end of the process through an updated stock assessment that completed a month before final action was scheduled. Commenters felt that the MSE process became somewhat hijacked by the new assessment results and discussing long-term harvest control rules became very difficult when the fishery was facing drastic quota reductions in the near term.

Some commenters remain skeptical that an MSE process provides more benefits compared to the traditional Council process. Some noted that Council meetings are already open to the public, the customary process is very transparent, and current analyses already evaluate impacts on various aspects of the ecosystem. Some felt the MSE attracted less vested stakeholders that caused more imbalance in the alternatives developed. However, others supported the wider stakeholder pool involved in this MSE and preferred having objectives clearly identified earlier in the process and more detailed analyses available upfront.

While many concerns were stated about the MSE process, and there was mixed input on its overall success, all who attended a joint Herring Advisory Panel and Committee meeting to discuss the MSE process recommended that the Council should update the Herring MSE soon. They noted that some aspects of this MSE were more successful than others, and perhaps a hybrid of completely open forums as well as more focused work groups could be used in the future. In the end, the feedback suggests the Council should update the Herring MSE, but when it does the process should be mindful of the recommendations provided in this document.

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2.0 INTRODUCTION AND BACKGROUND

The Management Strategy Evaluation (MSE) used to develop and analyze Acceptable Biological Catch (ABC) control rule alternatives in Amendment 8 to the Atlantic Herring FMP was the first time the New England Fishery Management Council (Council) used MSE in decision-making. This report summarizes Council efforts to take a step back to debrief and identify the benefits and/or drawbacks of the MSE process, as well as lessons learned.

This debrief is intended to evaluate the process used to integrate MSE into Amendment 8, identifying perceptions about pros and cons of the specific process used and lessons learned. The intent is to help inform future Council decisions on using MSE to manage Atlantic herring or for other purposes.

The Council conducted an MSE to help develop alternatives for an ABC control rule, or formula for setting catch limits. It was intended to be a collaborative decision-making process, involving more public input and technical analysis earlier in the amendment development process than normal. An MSE involves modelling to determine potential outcomes of different management approaches, ABC control rules in this case. MSE can help evaluate tradeoffs among objectives and which control rules would most likely meet management goals through model simulations.

The Council began working on Amendment 8 in 2015, conducting public scoping and setting the goals of this action. In January 2016, the Council decided to use MSE to help develop ABC control rule alternatives. The Council had hoped MSE could help test assumptions and uncertainties identified in the latest Atlantic herring stock assessment (assessed to be near carrying capacity, but actual biomass may be lower), provide greater upfront discussion of objectives, and quantify tradeoffs of alternatives.

MSEs typically take several years to finish and use invitation-only, small groups (15-25) of stakeholders to give input. The Council diverged from this norm for two reasons. First, the Council aimed to finish Amendment 8 in time to develop herring fishery catch limits for 2019-2021. Thus, this MSE had unusually constrained time limits, a target of under two years from start to finish. Second, the Council decided to have all points of stakeholder input (e.g., workshops) completely open to the public, so the MSE process could mirror the open Council process as much as possible. Relative to other MSEs, the degree of stakeholder participation was rare, if not unique, at least for U.S. fisheries (Feeney *et al.* 2019).

Phase 1 – Identify parameters to be tested (January-June 2016). The first public workshop, in May 2016, developed recommendations for objectives of the Atlantic herring ABC control rule, how progress towards these objectives may be measured (i.e., performance metrics), and the range of control rules to test. About 65 people attended, a diverse mix of fishermen, recreational anglers, scientists, managers, non-profit organizations, and others. In June 2016, upon review of the workshop recommendations and additional input from the Atlantic Herring Plan Development Team (PDT), Advisory Panel (AP), and Committee, the Council approved moving forward with the MSE. Although there was not universal support for all the recommendations, these groups supported evaluation of the full range of ideas. Concurrent with Phase 1, the PDT was also gathering data and background information to support the Committee and Council's work on addressing concerns about localized depletion, another goal of Amendment 8 would address.

Phase 2 – Simulation testing (July-November 2016). After Council approval of the fishery objectives, performance metrics and control rules to be tested, technical work proceeded over the summer and up until the second public workshop in December 2016. The Northeast Fisheries Science Center (NEFSC) technical team identified, refined, or developed models of Atlantic herring, predators, and fishery economics and tested control rule performance relative to the performance metrics. Concurrent with Phase 2, the work addressing concerns about localized depletion continued.

Phase 3 – Review results, identify additional improvements (December 2016). The Council held another public workshop in December 2016 to see the modelling results and provide more opportunity for public input. About 65 people attended, again from diverse backgrounds. Participants were asked to identify

what other MSE modeling and presentation of results would help in making Amendment 8 alternatives, considering what could be done within this current, first MSE and which may be done in future MSEs with improved data and/or models. To help the Council balance tradeoffs, participants were asked to identify acceptable ranges of performance for metrics and how the number of control rules modelled could be narrowed into an appropriate range of Amendment 8 alternatives. Concurrent with Phase 3, the work addressing concerns about localized depletion continued.

Phase 4 – Prepare for Peer Review MSE (January-February 2017). Based on the input from the second workshop, the NEFSC technical team refined the models and presentation of outcomes and made a summary report by February 2017.

Phase 5 – Peer review (March 2017). Since the technical models had novel aspects, and this was the first MSE in the Northeast U.S., the MSE models and process were peer reviewed in March 2017. The review panel recognized that a tremendous amount of work was completed in a rigorous manner under the time and resource constraints of this MSE. The panel agreed that the models (Atlantic herring, predator, and economic) were appropriate for evaluating ABC control rules for the Atlantic herring fishery in the context of herring's role as a forage fish. The panel concluded that the data, methods, and results of the MSE are appropriate for Council use when identifying and analyzing a range of ABC control rule alternatives for the Atlantic Herring FMP. The panel also concluded that the Atlantic herring MSE was the *best available science* at the time for evaluating the performance of herring control rules and their potential impact on key predators. The Council received the peer review results in April 2017.

Phase 6 - Incorporation into DEIS (January-September 2017). Concurrent with Phases 4 and 5, the Council developed a range of ABC control rule alternatives, approving them in April 2017. With the peer review input, the MSE results were further refined and integrated into the impact analysis of Amendment 8 alternatives over the summer. A contractor helped present MSE results in more user-friendly formats. In September, the Council approved the parts of the draft Amendment 8 related to the ABC control rule. Concurrent with Phases 4-6, the work addressing concerns about localized depletion continued.

Finishing and implementing Amendment 8. The remainder of 2017 was spent refining alternatives and impact analysis related to localized depletion, with the Council approving the Draft Environmental Impact Statement for public hearings in December 2017. Public hearings were held in the spring of 2018, just prior to the Atlantic herring stock assessment (NEFSC 2018), which resulted in a more negative outlook of the status of herring than was previously assessed. The Council selected final preferred alternatives for Amendment 8 in September 2018 and formally submitted the final EIS in May 2019. NMFS issued a notice of availability in August 2019 and the proposed rule published on October 9, 2019. The final rule with implementation date was still pending when this review was completed. More information about Amendment 8 is at: http://www.nefmc.org/library/amendment-8-2.

3.0 DEBRIEF METHODS

This MSE debrief was a 2019 work priority of the Council. In June 2019, The Council approved the workplan as developed by the Herring Plan Development Team with input of the Herring Committee and Advisory Panel. The debrief proceeded as outlined in Table 1.

The Council held a public comment period in July- August 2019, in which written comments were accepted on the MSE process. The public was encouraged to comment on ten specific topics (see below). Nine written comments were received, including one from the Northeast Fisheries Science Center (NEFSC). The full text of all written comments (letters and emails) are available for review by the Council and public, and a summary was prepared (NEFMC 2019b). The Herring PDT prepared its own comments, organized by the same ten topics, in a memo to the Herring Committee (NEFMC 2019a).

At an August 10 joint meeting of the Herring Committee and Advisory Panel, the public and PDT comments were presented. Next the AP, Committee and audience were invited to provide individual,

written feedback on the same ten topics. Over lunch, staff organized the comments and after lunch the attendees had a large group facilitated discussion to review their individual input, discuss lessons learned, and recommended whether there should be future iterations of this MSE for herring and, if so, how it may best be conducted.

Table 1 - Phases and timeline of the Atlantic herring MSE debrief

Phases	Purpose and/or steps	Timeline (2019)
Planning	Herring PDT and Committee develop purpose, goals and workplan (with AP input).	April-May
	Council approves the purpose, goals and work plan.	June 11-13
Gathering comments	Council has public comment period.	July 1-Aug. 9
	Public comments are summarized; PDT prepares its comments.	By Sept. 29
	Comments from public and PDT are reported to Committee and AP. Solicit AP and Committee input.	Sept. 10
Reporting	Council receives progress update.	Sept. 24
	PDT drafts final report (compiling public comment and PDT/AP/Committee input and recommendations).	Sept.-Oct.
	PDT finalizes report.	By Nov. 22
	Council receives final report.	Dec. 3-5

The Council received a brief update on the MSE debrief in September, and the Herring PDT drafted this final report for the Council to receive in December 2019. The entire range of input received during this MSE debrief is provided here. The source of the input (public, PDT, AP, Committee) is noted using symbols (Table 2). This report is NOT a consensus view. The number of bullets under each sub-topic does NOT necessarily indicate the number of commenters with certain views; individual comments were consolidated to avoid repetition. The number of individuals providing the various points of input is not summarized, though observations are made on whether there was general agreement or diversity of views on a given topic.

Table 2 - Symbols for noting the source of input on the MSE debrief

♥	Public
♠	Herring PDT
♣	Herring AP
♦	Herring Committee

Prior to this debrief, there was an external peer review (in March 2017) of this MSE, which focused on the methods, data and technical models (NEFMC, 2017). The peer review panel also provided some input on the general process, and that input has been summarized here in Section 5.0. In addition, Council and NEFSC staff members principally involved in this MSE prepared a paper with lessons learned about this process (Feeney et al, 2019). Input from that paper has been summarized in Section 5.0 as well.

4.0 SPECIFIC TOPICS FOR INPUT

Although input was welcomed on any aspect of the MSE, commenters were encouraged to focus on the MSE as a decision-making process, rather than the technical aspects of the MSE or the outcomes of Amendment 8 (e.g., the Council's preferred alternatives, regulatory changes). The Council sought input on:

1. ***Clarity of purpose and need*** for using MSE in Amendment 8.
2. ***Sufficiency of general education*** about MSE, how well MSE was understood (e.g., models, role of stakeholder input) and any ideas for improving the education process (e.g., more literature, online instructional webinars, in-person seminars)?
3. ***Utility of the six distinct phases of this MSE*** (described above), whether some phases (or aspects of phases) more useful or successful than others and whether the time provided for each phase enough.
4. Appropriateness of using open-invitation, public workshops for this MSE and/or recommendations for other formats.
5. ***Utility of how MSE results were presented*** in helping characterize the tradeoffs associated with various alternatives.
6. ***How well the Council integrated the MSE results*** and workshop input in developing Amendment 8 alternatives.
7. Utility of the MSE in balancing tradeoffs between objectives.
8. ***The benefits, if any, in using an MSE*** for Amendment 8, and if the benefits outweighed the costs.
9. ***How this MSE process compared*** to how else the Council could have developed and selected alternatives.
10. Other comments.

In addition to the ten specific topics listed above, staff specifically asked the Herring AP, Committee and PDT members three questions. These questions came out of discussions at the joint Herring AP and Committee meeting when this debrief was discussed. First, since many stakeholders felt rushed during this process, why did the Council not slow the process down? Second, could the MSE models and supporting data be trusted to provide robust advice? Third, and most importantly, should the Council update the Herring MSE soon (3-5 years)? Input specific for these three additional questions is summarized in Section 4.11.

4.1 CLARITY OF PURPOSE AND NEED

Summary: *Input on this topic was mixed. Several commenters felt that the purpose and need for using MSE was well described. Others felt that it may have been lost on some members of the Council and public.*

Was Clear

- The Council clearly communicated (e.g., in MSE documents) why MSE was being used and why it was necessary for developing Amendment 8. ♥ ♠ ♣ ♦
- The outreach was extensive; ample notice was given and plenty of material was available. ♠ ♦

Was Unclear

- The purpose and need for MSE over traditional decision-making were described but lost on some members of the Council and public, particularly the herring fishery. ♠ ♦

- MSE was a useful tool to meet the A8 objective of developing an ABC control rule, but several stakeholders and Council members did not understand how an MSE process worked (models, metrics, what steps, expected participant contributions, etc.). People did not fully understand how tradeoffs were evaluated. ♠ ♦
- The purpose and need were not clear enough at the start, but by the time there was clarity, it was too late. ♠ ♣
- Some workshop goers tried to expand the MSE purpose, wasting valuable workshop time. ♥
- It was too difficult to find a clearly stated purpose and need for using MSE in Amendment 8. ♠
- The need for MSE was unclear. Needing to use MSE because other fisheries have had success with it is not enough justification. Are those fisheries as politically contentious? ♣

Mixed/Neutral

- It seemed like the Council was more interested in testing the MSE approach than doing an MSE for herring per se. ♥
- Being the Council's first MSE, it was a bit confusing. ♦
- The Council could have been clearer on why localized depletion was not being incorporated into this MSE. ♦
- In the first half of 2015, there was some preliminary MSE work and discussions by the Scientific and Statistical Committee and joint Herring/EBFM Committee about using an MSE approach. At the January 2016 Herring AP and Committee meetings, MSE was more formally introduced and these bodies were asked whether they would support using MSE for developing alternatives and impact analysis. At those meetings, there was not much discussion of how else the Council might accomplish this work. After a few people asked questions, there were near unanimous motions to use MSE (one abstention by a Committee member). At the January Council meeting, the motion to use MSE carried 16/1/0. This all does not necessarily mean that people were clear, but at least supportive of trying this new approach. ♠

4.2 SUFFICIENCY OF GENERAL EDUCATION

Summary: *For the most part, commenters felt that the MSE process would have been strengthened with more education of Council members and the public about MSE in general and on this specific MSE.*

Was Sufficient

- MSE was new to nearly all who participated in the process, but the Council did a good job with education and making materials available in advance of the workshops. ♥ ♦
- The information was there if people cared enough to really dig into it. ♣
- The MSE concept was well described at the outset of the first public workshop. ♠

Was Insufficient

- There was insufficient time spent on education. ♠ ♦
- Despite lots of good effort by staff, above average for Council actions, most people involved lacked understanding and there was still room for improvement. ♠ ♣ ♦
- The material was too technical, taking too much brain power to engage in and understand, even for seasoned participants in herring management. The general public was likely lost. ♠ ♣ ♦
- The level of understanding varied among workshop participants: some came better prepared than others and some left part-way through because the presentations were too technical. ♥

- In January 2016, when the AP and Cte were asked to support using an MSE approach, the only background information provided for those meetings were a few PowerPoint presentations. The AP asked for more background info, but staff did not provide much more until Workshop 1. One limitation was in securing copyright permissions from publishers (Punt (2017) was distributed). Staff also struggled to find existing documents that provided non-technical, simple descriptions of MSE. Thus, the MSE technical team and staff wrote a white paper (NEFMC 2016). ♠
- Stakeholders did not understand how their input would be used or how the MSE would inform managers. There was a lack of time built into the process for this purpose. ♠
- The multi-faceted scope of data analysis from the MSE was large, and generated volumes of outputs that were probably difficult for non-experts to digest and easily understand. ♠
- Some stakeholders never fully understood how to interpret the MSE or the MSE process. When recommending a final preferred alternative, an AP member said that he did not care what the fishery would be like more than 100 years into the future, assuming incorrectly that was the outcome of the model. ♠

Improved over time

- Once the process got going, the stakeholders understood better. The first workshop seemed more like a public comment session, but subsequently, stakeholders were more engaged. ♠
- The only way metrics and models could be understood was to stay engaged through the workshops and follow presentations at PDT and other Council meetings. Continued exposure increased understanding. ♠ ♦
- There are benefits for stakeholders, including Council members, from listening in-person and having repetition of material. Everyone learns differently and has different backgrounds. The information became less complicated and more easily understood after several presentations of the same material. ♦

Ideas for Improvement

- Include time explicitly for education, especially before the formal process truly begins. Improving understanding up front would allow for more useful input at workshops, during "the meat" of the process. It is less helpful to finally understand the process once the time for input has passed. Providing detailed background for the Phase 1 workshop would be helpful. ♠
- Given the diversity of stakeholders, a range of materials may help (online materials for self-directed learning, posters/flyers, webinars, in person seminars). ♥
- Education materials:
  - Include more preparatory material with real-world and mock examples. ♥ ♠ ♣
  - Use layman approaches for understanding a complicated process by diverse people. ♠
  - Experts in education and communication should help in creating educational materials. ♥
  - NEFMC could partner with NEFSC (or perhaps the MREP program) to create materials. ♠
  - A web interface would help to explore the MSE results on one's own (e.g., a "shiny" app). ♠
- Webinars:
  - Have an informational webinar in advance of technical workshops. ♥ ♣
  - Require workshop participants to attend an educational webinar in advance. ♣
  - Interactive webinars or on-line tutorials would avoid the hassle of an in-person meeting. ♠

- DO NOT have informational webinars. Fishermen would be unlikely to participate, and the Council should spend its limited resources elsewhere. ♥

- Terms and performance metrics were confusing. Clearly defining terms and identifying universal, understandable performance metrics for scoring MSE outputs would help compare them. ♠
- The workshop small groups were so diverse it was very challenging to get everyone at the same level. Maybe the way we conduct public hearings at the beginning of a process could have been used here as an opportunity to provide education in key ports/areas; the workshops were too large to serve that purpose effectively. ♠
- Education would likely have been easier with a smaller, invitation-only group. ♠

4.3 UTILITY OF THE SIX DISTINCT PHASES OF THIS MSE

***Summary**: For the most part, commenters felt that proceeding through the MSE in distinct phases was useful, but that the process was rushed.*

Generally

- Using the six phases was a clear, useful and logical approach. ♥ ♠ ♣ ♦
- Considering this was the Council's first MSE, we did a good job. ♦
- A Council-centered process helps with buy-in and acceptance of outcomes. ♠
- Timeframe was rushed:
  - All phases were rushed; we needed more education up front and time to incorporate MSE results into alternatives and balance tradeoffs. ♥ ♦
  - The push to get Amendment 8 done to use in 2019 specifications short-changed the MSE. ♠
  - Future MSEs by NEFMC could have shorter timelines, but the first one should have had a longer timeline. ♦
  - Managers could not fully analyze the impact of the final preferred alternative given how the assessment changed things. The end of the process was rushed. ♣
  - May be worth building in delays for unforeseen circumstances – build something into MSE to slow down the process if needed (e.g. new assessment with drastically different results). ♣
  - Each phase was hurried, which was detrimental to stakeholder understanding of the MSE and may have ultimately created a negative impression of MSE as a tool more generally. ♠
  - Given the newness of MSE, it could be beneficial to provide more time and opportunity for stakeholders to revisit and provide input on parameters. It was an extensive amount of work in a short period of time. A major drawback was the hurdle of learning how to understand the outputs of the MSE datasets. Participants did not have enough time to digest and understand each phase of the process. ♠ ♦
  - Would the Council have been willing to extend the A8 timeline to do MSE "right"? ♠
- The Council's efforts to keep the MSE on schedule to be used for 2019 specifications were appreciated. ♥

The workshops generally

- Workshops were good discussion forums and opportunities for the public to interact with each other and with scientists. ♠

- The workshops were overwhelmed with politics. ♦
- Facilitators should have been more familiar with the fishery and MSE methods, and some facilitators were partial to certain views. ♥
- There should have been more vetting of the questions asked of workshop participants. ♥
- The economic metrics in general were challenging for industry to articulate and for analysts to translate. For example, the industry input on stability during the workshops was misinterpreted. The metrics developed for stability and streakiness did not fully incorporate the issues industry identified as important. ♥
- Herring community became more polarized. ♣

Phase 1 (workshop # 1)

- The first phase was well paced with a good format. ♦
- The small group discussions at the first workshop were effective in facilitating a deeper understanding of the objective setting process. ♠
- Stakeholder input should have ended after the first workshop. ♥
- Ideas raised at the first workshop that may not be feasible should not be have been analyzed. ♥

Phase 2 (technical analyses)

- There was not enough time for analysis between workshops. ♥ ♠
- Spend more time early in the process on improving visualizations. ♥

Phase 3 (workshop # 2)

- There should have been a webinar before the second workshop to preview results. ♥
- Workshop 2 was smoother than 1, as we were all a bit more experienced. ♠
- Workshop 2 was useful for having the public participate in person and interact with different stakeholders and subject matter experts. ♠
- There could have been more time for discussion and narrowing down options but attending for two days is already a lot to ask of the public. ♠
- Results presented should have included numbers related to quota impacts. ♣
- In the future, it may be beneficial to reduce the number of evaluation options to those that more starkly contrast one-another. ♠

Phase 4 (finalizing results)

- There was not enough time for analysis after the second workshop. ♥
- There should have been a third workshop to help digest results, perhaps online. ♥ ♠ ♣

Phase 5 (peer review)

- Peer review was good, but it was hard to find qualified reviewers. ♦
- A lot of time was spent preparing for the peer review, which was an important phase, but it took valuable time away from analysts translating and using results in management. ♠
- Peer review presentations to the Council were useful towards understanding the process. ♠

Phase 6 (incorporation into A8)

- The way the assessment came made Phase 6 feel very rushed (Council went from figuring it out to voting – too quick). The biggest mistake was at the end, making a final decision right

after the assessment without more consideration. The benefits of the MSE were not realized) ♣ ♦

- The later part of the MSE, especially the end, felt rushed. The new assessment really changed everything. After it was published, an unstoppable train started moving. Outcomes would have been different if not for the assessment. ♣
- Phase 6 would have gone much more smoothly if it was consecutive instead of concurrent to Phases 4 and 5. Not having results of the peer review made Phase 6 more challenging. ♠
- Phase 6 could have been more transparent with better rationale for why certain options were rejected. ♠
- In Phase 6, there was limited opportunity for feedback with the Committee in identifying and refining alternatives. Staff tried to accomplish this over two Committee meetings, but it was all crammed into the second meeting, because at the first meeting, the Committee was not ready to identify alternatives. Perhaps an overall range could have been identified first, and then a second phase built in for refinement of alternatives once folks were presented results and had a better understanding of the impacts of the larger range of options. ♠

4.4 APPROPRIATENESS OF USING OPEN-INVITATION, PUBLIC WORKSHOPS

Summary: *Input was mixed on this topic, some commenters felt the completely open process used in this instance was critical, and others felt the size made it difficult to have productive conversations and created imbalances. Many commented that the Council may want to explore a hybrid approach in the future that combines use of open-invitation workshops and more focused work group meetings.*

Open process was appropriate

- It was important for this action, being as controversial as it was, and because it was the first MSE conducted by this Council. We may have gotten more valuable input from a smaller group of invited participants but keeping everything transparent was key. ♥ ♠ ♦
- An open public process is needed because herring is a public resource; stakeholders have a right to participate. ♣ ♦
- A wide range of stakeholders participated, adding new voices, ideas and data. New scientists (e.g., from USFWS) broadened the value and improved the modelling; this seemed was a benefit. ♥ ♣ ♦
- There was no good way to limit participation, so it was done as well as possible. ♦
- Given the rush, there was not time to develop a stakeholder selection process for a closed group that would be widely viewed as transparent. We had greater concern for process-derailment with selecting a closed group versus the uncertainties that come with an open process. ♠
- The workshops had to be public, because they were Council-run. ♠
- This is the only way to get all stakeholders to the table and participating. ♠

Mixed input and caveats

- Transparency is a must but getting all stakeholders in the room can be difficult. ♦
- Using an open workshop was difficult, but the Council did not have much choice. Ideally, an MSE closed-group would consist of people who can work together, agree on facts and the need for action, and possibly approach consensus. ♠

- Ideally, the group would be able to come to a compromise conclusion on what a suitable control rule would be for all parties; having such a large and varied constituency did not allow for this. ♠
- Open was useful to get broad interest and input, but most people did not understand MSE and there were times when constructive conversation devolved into more political battles. ♦
- The workshops were too big to be effective for MSE. Need to find a balance between the importance of having open participation and the need for reasonable size working groups to be effective. ♦
- The decision to use open versus invite should be driven by question at hand. Only use open-invitation workshops if the topic to be evaluated requires such broad participation. Otherwise, some sort of invite only or sub-group process would probably be enough. There is existing literature on how to construct functional stakeholder groups. ♠ ♦
- It was useful to get broad perspectives across interest groups, and this mirrored the classic Council public input process. However, since not all participants or facilitators were subject matter experts, and even experts were not familiar with all aspects, it took participants a while to understand the complicated process, their input was widely varied (making ranges harder to narrow down), and not all input was quantitative (therefore not easy to plug into metrics). ♠
- It is good to have stakeholder input informing the document and an opportunity for stakeholders to interact with subject matter experts, but maybe there is a way for stakeholders to participate at a higher level that does not include specific metric and numerical decisions. ♠
- ASMFC took a different route with an equally contentious MSE (for menhaden), where a few representatives and managers were invited (ASMFC 2015). That process was smoother, but there were concerns about exclusivity, and buy-in across stakeholders was lacking. The NEFMC process was more open, making some of the workshops difficult and time consuming to attend. There was more buy-in to the NEFMC approach, but it is unclear whether that is due to the workshop or the outcomes. ♠
- If a smaller invited group is used in the future, there should be points for public input along the way – it cannot be developed in a vacuum with no opportunity for input from those not "at the table." ♠

Favor closed participation

- Perhaps take a hybrid approach next time. Open invite was good for first MSE but should probably be limited somewhat, creating guidelines for participation. ♠ ♦
- Open invite was a bad idea. Far too many people were uninformed and entered the MSE with their own ideas of what should happen with herring and pushed that agenda. It was too hard to have productive conversations, because there was insufficient common understanding of herring management, MSE, the law, etc. ♥ ♣
- Set MSE participant qualifications: 1) Require participation in MREP, 2) Require participants to serve/ have served on an AP, Council, SSC, ASMFC Advisory or state marine fisheries advisory council, 3) Require attendance at a related webinar. ♣
- The open approach was not helpful in allowing fishery to have a reasonable potential to realize sustained yield from resource. The industry was outweighed in the process. ♥ ♣
- Such and open forum should not be used for any fishery. The process should involve those who participate all the time. ♣

- A more level playing field with representation of a broad range of stakeholders would have been more productive. ♥
- A targeted invitation may have provided better input for this process with representation from key stakeholders, particularly when broken up into small groups. Some perspectives were overrepresented and some underrepresented in the various groups. It was easy for the feedback of the highest numbers to overwhelm both the discussion and in group-think. ♠

4.5 UTILITY OF HOW MSE RESULTS WERE PRESENTED

***Summary**: For the most part, commenters felt that it was very challenging to present MSE results in simple formats, though approaches improved over the course of the MSE.*

Was useful

- The analysis was useful, even if difficult to parse. ♥
- Visuals accompanied by a presentation were best; it was hard to interpret visuals alone without an explanation from an expert. ♥ ♠
- Staff and SMAST contractors did an excellent, thorough job presenting MSE analyses at multiple venues. Requests for modified and expanded analyses were promptly provided. ♠ ♦
- Substantial work was put into condensing and organizing results in different ways to facilitate understanding. The web diagrams were helpful. ♠

Was difficult

- This MSE struggled with so many operating models; it was very challenging to present meaningful results across eight different states of nature that were so variable. ♠
- The results were overwhelming and too complicated for most to understand. There was a nauseating amount if technical information (too many metrics). ♥ ♦
- The crunched timeline limited communications efforts and fully understanding how results would apply to management. Graphics were made quickly with insufficient written explanations. ♥ ♠ ♦
- Presenters struggled to "dumb it down" enough. MSE is complicated, and much effort went into explaining it. ♣
- Results were interpreted differently based on stakeholder perspective. ♦
- There could have been greater use of MSE results in understanding and evaluating tradeoffs if MSE outputs were simpler and more familiar. It seemed that managers were ill-prepared for discussions and decision-making. ♥
- There should have been more "hard numbers" (e.g., quota impacts) and text descriptions. ♥ ♣

Improved over time

- Presentation of results got progressively more helpful and the graphics eventually made by SMAST contractors were helpful, but they were not available during workshops. ♠ ♦
- The web diagrams were hard to digest but were understood better as time went on. ♦
- Initially, it was overwhelming for most stakeholders (especially those not involved in the MSE process) to comprehend. It seemed to become more understandable as the number of alternatives decreased and more effort was put into explaining the results. ♠
- The PDT reviewed/previewed MSE results several times. Although this seemed redundant at the time, it was in part, to help identify the best way to communicate the process/results/tradeoffs to

the public. If additional MSEs are undertaken, the PDT recommendations for presenting MSE results should be incorporated. ♠

Ideas for improvement

- Simplify presentations. Have a non-scientist do more of the explaining. ♥ ♣ ♦
- Do different framing. Ask what the acceptable level of risk is. It is simpler than it seemed. ♣
- Do not rush this process. Everyone was learning and was challenged. ♣
- Development of an interactive/on-line user interface (e.g., shiny app) would allow stakeholders to "play" on their own time outside of workshops. ♠
- An MSE with more focused objectives/parameters could have been helpful, resulting in fewer outputs with more contrast between options and therefore easier to concisely present. ♠
- Information could have been presented in layman terms more, to get across the point to the audiences at multiple levels. ♠
- Infographics are helpful to use when describing complicated processes. ♠

4.6 How well the Council integrated the MSE into A8

Summary*: Comments on this topic were mixed. Workshop input was, to varying degrees, reflected in the alternatives, but it could have been clearer upfront what the process was for translating workshop input into Amendment 8.*

Was satisfactory

- I personally tried to integrate the deliverables from the MSE into my Council work. ♦
- The Council used the outputs constructively and integrated results well into DEIS. ♥ ♣ ♦
- The Council did better than expected, as best as possible under the time constraints and struggles to understand concepts. ♠ ♦
- PDT/Council did a decent job picking the most relevant alternatives. ♣ ♦
- Virtually all the Workshop 1 recommendations for objectives and parameters to be tested were accepted, showing a willingness by the Council to respect the novel MSE process. ♠
- Many ideas from Workshop 2 shaped the alternatives. ♠
- The Committee used an MSE approach to create the range of alternatives: identifying quantitative performance criteria, then selecting a range of alternatives based on the criteria. ♠ ♦
- True, the final range of alternatives was not exactly what came out of workshop 2, but the Council never promised that it would cede its role in approving the range of alternatives to attendees of an open-invite workshop. ♠
- Because the MSE was methodical and careful, there was little room for the results to be ignored by the Council when crafting alternatives. ♠
- The alternatives seemed to cover the viewpoints of most stakeholders, which was important. ♠

Was NOT satisfactory

- It took a lot of input and iteration by the PDT and Committee to narrow down the potential alternatives that came out of the second workshop to the ultimate range of alternatives analyzed in Amendment 8. The Committee struggled with using the results. ♥ ♠
- Some workshop participants were critical that the range of alternatives did not reflect the range of input from the workshops. There could have a more explicit link between

stakeholder input from the workshops and the preferred performance specified by the Council. ♠

- The Council's ability to modify the range of alternatives likely undermined some of the engagement/trust of the MSE participants. ♠

Ideas for improvement

- Some qualitative analyses in the EIS could have been analyzed quantitatively in the MSE with better planning (e.g., impacts to predators such as striped bass, sea turtles, sturgeon, Atlantic salmon, habitat). ♥ ♠
- Be more explicit on when legal requirements to institute a rebuilding plan would trump use of a control rule. ♥
- Provide more rationale on why a workshop recommendation was not taken up by the Council. ♥
    - Spend more time narrowing down the range of alternatives with public input at the workshop level to ease the burden of work for the PDT and Committee and to allow for more transparency on the decisions that led to the final range of alternatives. ♠
    - Council members should have been more integrated throughout to help minimize disconnects between workshop outcomes and Council decisions, rather than increasing their level of involvement at the latter stages of the process. ♠
    - The Council could have been more specific in what they were looking for in the development of alternatives, given that the final preferred alternative was a modification from what was developed through the MSE. ♠
    - In future, the Council might consider an explicit "phase-in" plan where a management measure is implemented incrementally over a few years. This would avoid the shock associated with an overnight change in management, especially when accompanied by drastic cuts in quota. ♠
    - If Council wants to continue using MSE as a tool, then needs to be serious consideration for what timeframes would work to align MSE with specification cycles. ♥

4.7 UTILITY OF THE MSE IN BALANCING TRADEOFFS

Summary: This question was likely unclear; some commenters focused on whether the MSE analyses were useful for evaluating tradeoffs, and some commenters focused on whether the final ABC control rule alternative selected in Amendment 8 was "balanced", and if the process helped to foster compromise. The intent was the former, to get input on whether the MSE process and analyses helped stakeholders evaluate tradeoffs more effectively than contemporary methods, but some commenters are under the impression that MSEs are intended to help reach consensus or compromise, which is not the case.

Was useful for evaluating tradeoffs

- MSE is a good data-driven method to analyze different parameters of importance and show how tradeoffs could be balanced, understanding that the analysis was only as good as the data being used. This was the strongest part of the process. Without MSE, many of these tradeoffs would have been imperceptible. ♠ ♦

- This was difficult initially, as there was so much information, but the Council staff distilled it well. The discussions of tradeoffs at Council meetings was clear and well done. ♠
    - It was a good way to balance tradeoffs, however it was not based on enough science. ♣

Was not useful for evaluating tradeoffs

- I am not sold on MSE, because the choice of objectives is so critical yet so subjective. The tuna condition objective was a farce and was not useful for evaluating that metric. In theory, MSE is meant to help balance tradeoffs, it may not be better than a regular process. ♣
- There should have been more iterative work at the Herring Committee to balance tradeoffs and there was no need to rush to meet timelines. ♥
- It was hard to understand exactly how the tradeoffs related to each other. They could have been explained in more detail. The different inputs/objectives felt separate even within a single alternative. ♠
- Data limitations (marine mammals, tunas, etc.) reduced the utility of the models. ♦
- Developing a predator model was a valiant effort, but there was unfortunately insufficient data for it to make realistic comparisons of alternatives. This was explained numerous times. However, some stakeholders used the lack of difference in predator outcomes to lobby for preferred alternatives. This was a misunderstanding/misuse of the MSE outcomes. ♠

- MSE is more useful for long-term impact analysis. Insufficient time and effort were spent on preparing short-term impact analysis. In the end, the Council and public leaned heavily on the short-term analysis versus the MSE results. This was likely due to: the outcomes of the 2018 herring assessment, the short-term analysis was more akin to what people were used to seeing (perhaps understood better than the MSE), and a general focus on short-term outcomes. ♥ ♠

Did process bring more balance or compromise?

- The final preferred alternative balanced tradeoffs among objectives relatively well, considering yield, variation in yield, and some metrics related to biomass conservation (e.g., probability of overfishing) - balancing fishery and conservation objectives. ♥ ♠ ♦
- MSE is designed to quantitatively evaluate tradeoffs; some felt tradeoffs were not balanced enough, the process did not have much influence on changing the diverse positions of managers and stakeholders on herring management. ♥ ♠ ♦
- Workshop input was imbalanced, which carried through the MSE. ♥
- Tradeoffs were not balanced in the end, despite the diversity of objectives identified. ♣
- The outcome was unnecessarily conservative. The objectives of the MSE and the HCR were not balanced among stakeholder interests, i.e., hard lean towards conservation. ♦ ♥

4.8 THE BENEFITS, IF ANY, IN USING AN MSE

Summary: *Input was mixed; commenters felt the benefits of using an MSE process outweighed the costs, and others did not.*

Benefits

- Due to the complexity of the many user groups in the herring fishery, this was a good approach. ♦
- Public input and transparency increased. Stakeholders seemed to feel more heavily engaged in the process. ♥ ♠ ♣ ♦
- Appreciated having some analysis of a variety of alternatives before selecting range of alternatives to address problem statement. ♦
- Better consideration of multiple objectives and tradeoffs. If the process had more time, the benefits may have been recognized by more people. ♦
- Fisheries management is very controversial and using MSE reduced fighting and conflict among stakeholders. ♣

- MSE is a more balanced system for coming up with alternatives. ♣
- Including stakeholders not often in the room added a lot of value. ♣ ♠
- Appreciate starting with clear goals then applying toward science and CR model. ♣
- The goals of Amendment 8 were well suited to using an MSE that evaluated and synthesized perspectives from a variety of stakeholders. ♠
- Stakeholders used MSE outputs to form their public comment. ♠
- Lines of communication among user groups were opened that may not have otherwise occurred. People did not seem to become long-term friends, but the conversations were collegial and that can pay dividends. ♠
- It offers a good, structured approach to evaluating and balancing competing objectives, which will only improve with time as more MSEs are completed. It is appropriate for fisheries with recurring issues of tradeoffs between management objectives. ♠
- It provided a large range of alternatives to be considered. ♠
- MSE was able to identify both strong and weak relationships in the ecosystem with respect to forage links. ♦
- Other approaches would have likely involved more ill-informed discussion and political bickering. ♠
- The new forum/process allowed managers to think of decisions and tradeoffs in different ways. ♠
- More technical analysis than normal. ♥
- A big benefit was being able to evaluate the control rules across metrics. ♠
- The Council's proposed action may have looked very similar with or without an MSE, but the MSE helped provide important rationale (relative to the metrics) for the proposed action. ♠
- There was general acceptance of the outcome. Leading up to the last Council vote, stakeholders publicly noted that while not ideal, they would support the selected control rule. While the industry is in dismay at the state of herring, they seem to understand and appreciate the process and logic behind the control rule. ♥ ♠
- In future, the success of the control rule can be evaluated by revisiting the performance metrics and models. ♥ ♠
- MSE accounts for the many user groups and should be continued regardless of costs. ♦

Costs

- Too technical and fast tracked. ♦
- Imbalanced objectives ♣
- The process attracted people who have not continued to participate in Council meetings after the workshops. ♠ ♣
- The true benefits of the model outputs were not achieved. Timelines were more important than outcomes. ♥
- Diverse open workshops required significantly more education and got sidetracked with issues that the MSE could not address. ♥
- The technical analysis could have been done through the standard Council process. ♥
- We aimed to implement A8 in 2018, with or without MSE, and clearly blew past that goal. It took more time for staff and stakeholders, and it took time for participants to understand the process well enough to provide informed input. ♠ ♦

- The MSE was hindered by data availability, proxies, and the fact it could not really consider spatial elements. ♠
- Control rules and models are highly technical, so this process would be more useful if it was less technical and quantitative and a more approachable subject for participants. ♠
- Managers and stakeholders were overwhelmed with the over-abundance of data and info to process. ♠
- The newness of MSE probably created some confusion and contributed to some difficulties in selecting alternatives. ♠
- Perhaps the range of alternatives was not large enough, as the Council's final decision was not one of the original alternatives. ♠
- A scientific process, normally, was hijacked by a political process of "stakeholders" not understanding the history of the 100-year old fishery. ♥ ♣
- It was a lot of work for those directly involved. ♠

Did benefits outweigh costs?

Yes

- Given the Council's intent to create a long-term control rule, MSE was the most appropriate way to support an informed decision. ♥ ♠
- There was more analysis and justification of the preferred alternative. ♠
- This was critical in setting up the change in herring management. There were clear goals and objectives even if there was not agreement on the outcome by stakeholders. ♠
- This is a preferred method for contentious issues. ♣

No

- Not convinced the existing management (+/- 20 years) benefitted at all from this process. ♣
- The benefits (options that consider a wide range of potential influences from multiple stakeholder groups) did not outweigh the costs (time, money, effort) in this case. ♠ ♣
- Herring was a tough MSE to start with (complex, political, divisive, difficult to understand tradeoffs). ♦
- It would be hard to argue that the process was successful given that the final alternative was modified in year 1 and not used at all in year 2 of the specifications for which it was developed. The SSC decided to go against what the chosen alternative was for 2021 and implement a far more conservative catch limit. NMFS still has not officially ruled on the Council's preferred control rule. ♠
- Put $$ and time into actual problem-solving and science. E.g. Georges Bank spawning surveys/sampling so that today's motion was grounded in facts vs. drawing BIG boxes and closing only herring fishing vs all bottom gears. ♣

4.9 COMPARE MSE PROCESS TO OTHER APPROACHES

Summary: *Input was mixed; commenters felt the MSE process was superior to contemporary approaches, and others commented that it was ultimately no different than the current Council process used to develop and analyze actions.*

Input, collaboration, transparency

MSE superior

- The workshops had 145 people attend, 65 of whom do not regularly engage in herring management. Thus, new people were drawn in. The workshops had substantially more and varied public input than Committee meetings. ♥ ♠ ♣ ♦
- In a highly polarized and contentious fishery, this was refreshing, more collaborative. Conversation was possible. ♣ ♦
- It was easier to see how the Council got from "there" to "here" in a more transparent way than usual for such a complex issue. The staff and analysts were easier to access. ♥ ♠ ♦
- An MSE process can be good, but it depends on how the objectives get defined. A lot of participation which is good. ♣

No different

- MSE is not needed to give public a voice because the Council is already a very public forum and many ways to get involved. ♣
- The industry got destroyed in this process because, as usual, we got minimalized by the number of opposing voices. ♣
- I don't recommend MSE for forage fish at all. Too controversial. ♣
- Scared of MSE because how objectives get defined, any and all input from stakeholders may not be appropriate. ♣

Amendment development

MSE superior

- The Council usually breezes through development of goals for an action and discussing problems that an action is intended to solve. It then becomes difficult to develop alternatives that might meet these goals or solve problems. An MSE forces the Council to think more explicitly about the goals and problems upfront, so developing alternatives becomes easier. Otherwise, people would have been promoting their favorite control rule without having a common discussion of what we are trying to achieve (i.e., less stabbing in the dark). ♠ ♣
- The traditional alternative development process in this region usually involves posturing and politics. MSE helped lessen this by providing a structured framework for input and decision-making. MSE was appropriate for this complex problem of setting a harvest control rule that balances the tradeoffs between multiple objectives (in a forage stock that has inherently stochastic dynamics). It provided a wider range of possible control rules to narrow into alternatives. ♠
- Greater workload results in a greater understanding of the ecosystem or highlights where impacts are less than expected. It took longer for me to understand the possible options for addressing the purpose and need of A8. In the end, it informed me appropriately. ♦
- Without MSE, we would have likely made the range of alternatives using ABC CRs used in other plans and regions. The range in A8 was designed to meet certain performance thresholds for key objectives specific to this plan. Without the MSE, the range would have been more random. ♠

No different

- There still would have been lots of meetings to develop alternatives. ♥
- The normal Council process is iterative and informed by science. MSE is a free-for-all and failed in drawing on NEFSC or on knowledge of fishing community. ♣

- There were just as many confused faces at decision time with or without MSE. ♣
- The MSE process was certainly lengthier and did not protract the amendment timeline. ♦ ♥
- What's wrong with the current process the Council uses to set specs? It is a transparent process and now we're adding another layer, need a problem statement with MSE. Need to be convinced why MSE is better than everything else. ♣

Scientific rigor, analysis, diverse considerations

MSE superior

- The MSE process allowed for evaluation of objectives that are not typically considered. Without MSE, impacts to the ecosystem and users that depend on the predators of herring would not have been considered. MSE in conjunction with an amendment action provides a deeper dive into the potential implications to the ecosystem. Understanding the tradeoffs of the control rule was a great benefit. ♥ ♦
- Even though the models are not perfect, having the MSE results did enable a direct way to compare the alternatives quantitatively. That is a benefit for the EIS compared to a few uncertain qualitative statements about the potential impacts. It is likely that the Council's proposed action would have looked very similar with or without an MSE, but the rationale (relative to the metrics) for the proposed action would have been less robust without an MSE. ♥ ♠ ♦
- Herring was tough but easier than other FMPs. ♣

No different

- Science needs to underpin everything the Council does. Workshop goers could state anything without any scientific basis and get it considered. MSE seems to decrease scientific rigor. ♣
- The same level of technical analysis could have been done through the standard process, which would have been more science-based and less political. ♥
- MSE made "herring community" more polarized vs. bringing people together around science. ♣

4.10 OTHER COMMENTS

Summary: *This section is a catch all for comments that did not fit in the previous categories.*

Localized depletion

- This MSE was seriously hampered, because A8 also considered alternatives to address localized depletion. Considering these two issues together was very challenging. It extended the timeline out confused the public about when and how to engage. If A8 was strictly focused on the ABC CR, it would have likely been easier for the public to focus and engage. ♠
- The MSE lacked economic analysis of impacts on users that depend on the predators of herring and wished for spatial considerations in future MSEs. ♥

Amendment 8 outcomes

- Some felt that the amendment did not go far enough in advancing ecosystem objectives, and others felt that it went too far. ♥
- Amendment 8 was disastrous for herring industry. Council members did not truly understand what they were voting for. ♣
- There was a very beneficial outcome for the ecosystem and hopefully the species. ♣

- Herring now has a lower probability of overfishing than any other species in the region. ♥
- Reducing fishing mortality as an outcome ignored scientific advice that the environment plays a greater role in driving recruitment than fishing. ♣
- The final rule should be delayed to ease the pain of assessment results (people feel stunned). ♣
- The status quo control rule was sufficiently robust to predator needs; the MSE was supposed to be a scientific process that was turned into a political process. ♥

Impacts of the 2018 herring stock assessment

- Unfortunately, the updated assessment shifted focus from a long-term approach to immediate impacts (MSE should be about the long term). ♣ ♦
- The assessment drove the bus. Once that was published, it was as if everyone made their mind up to vote for something that cut quota more. Assessment timing scared people off from MSE. Some did not fully understand the rule they voted for, but none of this is the fault of staff. It was just bad timing. ♣
- No one is talking about what the causes are of the assessment outcome. ♣

Participation of Council members in MSE

Should participate

- Being in listen-only mode gives others a chance for input. Important for Council members to be there but to listen and learn (their presence is not intimidating); learn more by being there and listening instead of reading someone else's interpretation of what someone said. ♥ ♦
- Council members should be fully engaged at every step of the process, all voices should be equal at the public workshops; everyone's input is important. ♥

Should not participate

- No Council members should be in attendance; their very presence can affect feedback. ♦
- The MSE process is designed to get input from the public that is then used by the Council to develop measures. Having Council members in the room can skew the raw input. ♦
- Council members should not participate. Send questions and ideas to be discussed at MSE. ♣

4.11 ADDITIONAL QUESTIONS THAT EMERGED DURING DEBRIEF

At the joint Herring AP and Committee meeting in September 2019, several questions rose up during the facilitated open discussion. Staff specifically asked the Herring AP and Committee members three questions. First, since many stakeholders felt rushed during this process, why did the Council not slow the process down? Second, could the MSE models and supporting data be trusted to provide robust advice? Third, and most importantly, should the Council update the Herring MSE soon (3-5 years)? The PDT was asked these questions in October via conference call, and all responses are provided here.

Summary: *While many concerns were expressed about this process and there was ultimately somewhat mixed input on the overall success, all participants that attended a joint Herring Advisory Panel and Committee meeting to discuss this overall process recommended that the Council should update the Herring MSE in the near future.*

1. ***If the Council wanted to slow down, why did it not do so?***

- Because of the assessment, no one wanted to move forward with the control rule in place if the biomass was as low as estimated. ♦
- Someone from the Council should have slowed down this process, but who was going to do that? People wanted to get A8 done because it had been a four-year action. Pieces of it did seem rushed and Council was under pressure to act. Who would slow it down? ♣ ♦
- The overall process was relatively long, but the bulk of real MSE work (identifying, analyzing and selecting alternatives) was under a year. That is a short amount of time for the Council and public to fully digest results. ♠
- MSE includes lots of analysis, so realistically participants would have always felt rushed, even if there was more time built into the process, somewhat unavoidable. ♠
- If the [MSE debrief] input to date were utilized in a traffic light chart, there would be more yellow and red than there would be green. ♦
- Somewhat surprised the Council felt rushed, this process was relatively long overall. The difference is likely because MSE tends to emphasize more time and effort upfront early in the process, whereas the Council process tends to take more time refining alternatives later in the process. Participants likely not used to this flip in process – more time spent upfront identifying objectives compared to tweaking alternatives at the end. ♠
- Ability to have an interface like a shiny app available would have been helpful. (R Shiny App is a tool that builds an interactive web-based program that allows stakeholders to manually adjust control rule parameters and alternatives to help evaluate tradeoffs. More and more MSE processes are incorporating this technology to help develop and evaluate harvest control rules in fisheries management. For example, there are five tuna Regional Fishery Management Organizations (RFMOs) that host a website with various examples of web-based tools that have been developed for tuna and tuna-like resources around the world (*https://rfmo-mse.github.io/*). A tool like these could be developed for the Northeast and made available during development of an MSE as a resource for the public and Council to better understand MSE models and analyses).♠
- In hindsight a phase in approach could have worked in this instance since the ABC CR decision came as relatively poor assessment results were completed. Taking final action when catches needed to be reduced was very challenging. It may be valuable to develop a more formal contingency or back-stop process that would prevent very large changes in quotas as a plan transitions to a new control rule. The PDT discussed that NMFS originally proposed a higher catch limit for 2019 that would have been more of a transition to the new control rule (50% probability of overfishing), but the Council did not support that approach. The original proposed in-season adjustment for 2019 was more ad-hoc and was not ultimately implemented, but there was some public support at the time for a phase-in approach to better stabilize catch levels. ♠

2. ***Could the data and models be trusted for robust guidance?***

- Data limited should be a concern – what are implications for EBFM and level of robust results – data was limiting but best we have. ♦
- Had a lot of trouble with data, but Council made a decision about the level of risk they're comfortable with, but data informing the predator models were lacking (esp. tuna data). ♦ ♣
- Not enough time to appreciate results of 8 models and some outcomes (economic). ♦

- People had difficulty with long term and short term, some outcomes (economic impacts) didn't make any sense / rational; no opportunity to go through outputs in detail but overall seemed model outputs seemed fine. ♥
- Had 8 operating models with various assumptions, PDT felt a lot of pressure to identify which model best represents reality; people did not trust some of the models and it was hard for folks to look at all the models together which could have different relevance depending on the year. ♠
- Need to develop an estimate from best available science on marine mammal consumption. ♣
- Spatial considerations and climate change need better weight. ♣
- Need economic analysis that shows positive value to ecosystem, other fisheries, tourism. ♣
- Using the biased assessment model skewed the results and would lead you into a different direction. There should have been more consideration of the unbiased model. The Committee should have spent more time on this process before PDT did all that work. ♥
- General buy-in for the models and results from the updated assessment, and that general trust carried over into the MSE process. ♠

3. Should the Council update the herring MSE soon (3-5 years)?

Yes

- Need to re-examine the control rule for ABC; need iteration with different metrics, performance criteria, etc. – may lead to different outcomes / satisfaction. ♦
- Process fell short at the end; every model needs better data input and better science so could lead to different/better output. ♦
- Want to do another re-iteration after low fishing levels and thus low fishing data (i.e. variable or low data inputs, different resource status, etc.) – interested to see MSE process change/wave of outputs with different resource status. ♦
- Don't let go of this work. ♦
- We learned where data / info gaps exist – those should be changed/required now so they will be improved for the next iteration (i.e. tuna reporting). Model work should be done now so it is in better place before Council starts this process again. ♣
- Done sooner rather than later because of dissatisfaction with where we ended up and conservative CR (20% overfished?) - #4 and 5 of PDT recommendations. ♣
- The International Pacific Halibut Commission has a standing MSE committee – should continue with the one we have, because haven't really finished the current MSE, need to be educated on model outputs, can do this now, recommend this for priorities for next year. ♥
- Will need to revisit output and models to really see the process through. ♦
- Herring was a difficult plan to start with – missing a lot of data, lots of unknowns to simulate; if you look at scallop assessment there are fewer unknowns so more certainty. Herring is a very contentious FMP. Should think about this exercise with a vibrant, positive FMP (scallop). ♣ ♦
- Would like to see how this CR performs and the effects performance on the stock and fishery. ♦

Yes, but before it does the PDT recommends consideration of the following:

- Before another full MSE process is initiated, a useful first step could be having the PDT assess if something in the system has changed, if models are not performing as expected, etc. ♠

- Amendment 8 was intended to be a long-run perspective. The current rule should probably be in place for some time before it is changed so there is time to evaluate its performance. ♠
- It is understanding that there are some participants that want to revisit the ABC control rule decision, it is a controversial decision with various stakeholders involved. But before the Council updates the MSE the data should be improved first, otherwise the utility is limited. ♠
- There were justified criticisms of some of the models and data sources used in this MSE. Currently there are no ways to improve some of those in the near-term with the current level of resources available. Several PDT members wrote a paper about this MSE process that included some details about data limitations (Deroba et al, 2019). The PDT discussed that list should be reviewed and if possible those data limitations should be improved before MSE models are updated. The PDT recommends that resources should be invested in these issues in the near term so models can be improved next time the MSE is conducted. The items highlighted in Deroba et al 2019 are repeated here for reference. ♠

    1. *Evaluate how error in the estimate of reference points impacts the herring model.*
    2. *Evaluate uncertainty in life history traits over time (i.e. time-varying growth, time-varying natural mortality)*
    3. *Evaluate including a true stock assessment in the herring MSE model.*
    4. *Develop finer-scale co-occurrence data on predators, prey and fisheries to model predator-prey co-occurrence or availability at smaller, local scales (i.e. tuna and tern).*
    5. *Model predator responses to aggregate prey dynamics, not just one individual species at a time.*
    6. *Further explore food-web modelling to evaluate the effects of simultaneous interactions of multiple predators with herring and side effects on other forage species.*
    7. *A MICE approach could be taken using these models as a starting point to incorporate key multispecies feedbacks and even broadly spatial interactions in future iterations of the MSE, as was done for the California Current.*
    8. *The economic model of the herring fishery did not include fixed costs, so it was not possible to evaluate how firms may enter or exit a fishery.*
    9. *This economic model assumed that marginal costs are equal to average variable costs, constant for each fleet, and do not depend on the level of biomass. A more rigorous approach might include estimating a (economic) production function for the herring fishery.*
    10. *This economic model used symmetric implementation error; however, an asymmetric error term, in which the error depends on prices of inputs and outputs, or a more integrated biological and economic model is warranted.*
    11. *Consumer welfare measures could be determined from a demand curve for herring. Rigorous estimation of a demand curve for herring requires modeling all goods that are substitutes for herring, including mackerel, menhaden, squid, and other substitute baits.*
    12. *Consider portfolio methods, coupled ecosystem region models, and bioeconomic models to incorporate more components of the ecosystem*
    13. *Quantify the dollar value for non-use value of predators – would need to conduct surveys to get this data.*

5.0 ADDITIONAL INPUT OUTSIDE OF DEBRIEF PROCESS

In addition to the input received on the Herring MSE process through this debrief, there were other sources that offered useful advice.

Peer review: During the external peer review of the data and models used in this MSE completed in March 2017, the peer reviewers provided input on the MSE process as well. That was not the focus of that technical review, but the experts involved in that review have participated in various MSEs both nationally and internationally. Comments of the panel on the MSE process are provided in their final report and summarized here (NEFMC, 2017).

The peer review noted several specific strengths of the MSE process used for Amendment 8: 1) the timeline aligned with management needs; 2) outreach to stakeholders was strong; 3) process was collaborative, educational, flexible, and transparent; and 4) the lead facilitator was an MSE expert. Several areas for improved were also noted. First, the timeline should have been less constrained; the process needed more time for: workshops (possibly one more?); education to manage stakeholder expectations; and modification of operating models. Second, the stakeholder process could have been improved by: having an open scoping meeting followed by working group meetings; improving methods for getting input within workshops; ensuring small group facilitators have MSE expertise; more targeted outreach to diversify participation; and increased focus on social science objectives and metrics.

Published article: The Council and NEFSC staff who worked closely on the MSE, as well as the MSE lead facilitator, published an article on the stakeholder process (Feeney *et al.* 2019) as a companion to a more technical paper (Deroba *et al.* 2019) in a special issue on MSE of the *Canadian Journal of Fisheries and Aquatic Sciences*. In the stakeholder process paper, it was noted that although MSE have been used to manage fisheries globally since the 1980, and the MSE literature is rich in modelling aspects, there has been little emphasis on the degree of stakeholder engagement, the degree of public accessibility, and how the MSE was used in management.

Feeney et al. (2019) forwarded several best practices for stakeholder engagement (Table 3), concluding that using MSE "more effectively included public input throughout the amendment process and is better equipping interested parties with quantitative ways to evaluate tradeoffs…" They felt that it resulted "in a more thorough and integrated analysis than similar actions by this Council. Additionally, the open stakeholder process "proved to be a valid approach in this case, in which MSE was being introduced to an established fishery management system and stakeholder community where a high degree of controversy exists." Looking forward, the authors felt that the "clearest signal of the benefits of an MSE approach would be if managers or stakeholders request this type of analysis for future management actions that also require difficult choices."

Table 3 - Steps towards improving stakeholder engagement in MSE

Wielding the double-edged sword of inclusivity

- Consider an open-process MSE when legal constraints and/or degree of controversy demand a high level of public engagement.
- Use external facilitators for MSE public workshops.
- Have several scientists on-hand to help field stakeholder questions.
- Carefully consider potential negative outcomes of narrowing stakeholder recommendations prior to analysis.
- For inclusivity, evaluate specific control rules that stakeholders contribute.

Manage expectations

- In advance of the first workshop:
  - Make constraints on timelines, data, and modeling clear in advance of the first workshop.
  - Clarify the method and purpose of the MSE to reduce bargaining approaches.

Communicate simply • Ensure common understanding of MSE concepts and terms. • Use relatable analogies. • Present results in units understandable to the end user. • Retool communications products until they are understood. *Stand at a new vantage point* • Encourage a shift towards long-term thinking. *Build capacity* • Have general education on MSE precede workshops. *Evaluate the evaluation* • Evaluate the stakeholder engagement process in addition to technical work.
Source: From Feeney et al. (2019).

6.0 REFERENCES

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