

Introduction

Meeting Purpose and Objectives

Over the past two years, East Coast fishery management organizations have been working collaboratively and engaging diverse fishery stakeholders to explore jurisdictional and governance issues related to climate change, through the East Coast Climate Change Scenario Planning Initiative (initiative). Previous steps of the initiative included: 1) conducting a scoping process to seek feedback from stakeholders on issues facing East Coast fisheries over the next several decades; 2) exploring drivers of change in East Coast fisheries in more detail, 3) creating and refining a set of four scenarios describing possible conditions in 2042, and 4) seeking initial feedback from managers on potential changes in governance and management that may be necessary in response to climate related uncertainties.

The two-day summit meeting over February 15-16, 2023 will serve as the capstone to this initiative, where priorities and next steps for follow-on projects are identified. Summit participants will consist of representatives from each of the three U.S. East Coast Fishery Management Councils, the Atlantic States Marine Fisheries Commission, and NOAA Fisheries.

The goal of the summit is to develop a set of potential governance and management actions resulting from the scenario-based exploration of the future. Participants will **(i) review and refine ideas already generated throughout the process, (ii) add any new ideas, (iii) consider whether these ideas will work, and (iv) identify the practical next steps needed to take them forward.**

As a reminder, the overarching goals of this initiative are to:

1. Explore how East Coast fishery governance and management issues will be affected by climate driven change in fisheries, particularly changing stock availability and distributions.
2. Advance a set of tools and processes that provide flexible and robust fishery management strategies, which continue to promote fishery conservation and resilient fishing communities, and address uncertainty in an era of climate change.

Summit participants may also find it helpful to reference previous documents from this process, in particular:

- The [final scenario narratives document](#) (November 2022). An overview of the final scenario framework can also be found in **Appendix 1** below.
- The [summary of manager brainstorming sessions](#) (November 2022).

Additional documents and information about previous stages in this process can be found on the initiative webpage at: <https://www.mafmc.org/climate-change-scenario-planning>.

Guidelines and Ground Rules for Discussion

This summit is a unique opportunity to consider a broad range of potential management and governance changes to better prepare us for current and future challenges related to climate change. To ensure an effective and efficient discussion over the short two-day meeting, it will be important for participants to keep the following in mind:

- **Summit discussions should be focused on the future**, and its associated uncertainties, rather than on short-term solutions to the problems of today. To be clear, we are looking for strategies and actions that we can begin addressing now in order to better position ourselves for the future. This meeting and its outputs will **not** focus on short-term actions that address more immediate management issues.
- **This meeting, and the final report of potential actions, will not be able to address all important topics** that have been identified in this process so far. Climate change raises many important questions and uncertainties, covering a huge variety of management, governance, ecological, and socioeconomic issues. In order to arrive at meaningful conclusions, we need to focus the majority of discussion on a small number of themes. We will provide opportunities for cataloging other comments and recommendations outside of these categories, but they may not get extensive group discussion.
- **These discussions will require creativity, open mindedness, and a willingness to challenge our existing practices and assumptions.** Most summit participants have been involved in East Coast fishery management for many years, even decades, and have been involved in countless decisions that have shaped our current management system. This experience and expertise is invaluable, but it can sometimes prevent creative ideas from being considered. The summit is an opportunity to challenge some of the current processes and to move beyond them.

Next Steps: What Happens After the Summit?

Due to the focus on inter-jurisdictional fishery management and governance issues by this initiative, there are likely to be a variety of different types of actions that would be beneficial to pursue following the conclusion of the scenario planning process. Some actions would be appropriate to pursue on an individual Council, Commission, or agency level, while many others would require either informal coordination, formal and structured coordination, structural governance changes, and/or changes to policy or legislation.

The Summit meeting will seek to identify possible approaches for taking forward such actions and practical next steps to do so. The Northeast Region Coordinating Council (NRCC) will review the outputs of the summit at their Spring 2023 meeting and discuss a path forward for addressing the possible actions. The Councils and Commission will review the summit report and NRCC recommendations at their respective meetings later in 2023. Subsequently the participating East Coast managing organizations will begin evaluating individual and collaborative short- and long-term actions.

Key Issues for Consideration at the Summit

The New England, Mid Atlantic, and South Atlantic Fishery Management Councils and the Atlantic States Marine Fisheries Commission held workshops during their respective November and December 2022 meetings as part of the initiative. The purpose of each workshop was for Council members and Commissioners to have in-depth discussions on the four scenarios developed for this initiative (see **Appendix 1** for scenario matrix overview), and to provide ideas and recommendations to be considered as managers develop the final list of potential actions resulting from this process. Council and Commission members discussed the challenges and opportunities presented by each scenario, and reviewed ideas and input generated at the September/October [manager brainstorming sessions](#). A summary of input received during the Council and Commission meetings can be found in **Appendix 2**.

Based on the outcomes of the Council and Commission meetings, the three themes described in the remainder of this document were considered the most important to focus on at the Summit. Given the interrelated nature of fishery management, the themes below cannot be considered truly separate - there are many links and overlaps between them.

For each of the themes, the summit discussions will broadly follow a similar process:

1. First, identification of some key questions within the theme. These will be framed as important challenges that we are looking to address.
2. Describe a small number of actions that have been suggested by participants in previous steps of this initiative that have the potential to offer solutions to the challenge.
3. Suggest and discuss some important considerations about these potential actions. For example, have they worked in other situations? Are there barriers to implementing them? Is the potential action suitable under a range of future conditions, or would it be useful in more specific circumstances?
4. Explore the practical next steps to move forward with any of these potential actions. Can we make progress soon? In which case, who takes the ideas forward? Will some elements need further discussion? If so, what form does this take?

Theme 1: Cross-Jurisdictional Governance

Overview

One of the priorities of this initiative from the beginning has been to evaluate our current East Coast fishery governance structure for the East Coast fisheries, and to identify improvements that would help it be more adaptable to changing conditions, particularly changes in species distribution and abundance. This was a primary focus of all recent Council and Commission discussions.

For this topic, the focus is primarily on “governance” as opposed to “management” - which is more directly addressed in Theme 2: Managing Under Increased Uncertainty later in this document. Although the concepts of governance and management can be difficult to distinguish and are certainly interrelated, for the purposes of this discussion, we would define governance vs. management in the following manner:

| | |
|-----------------------|--|
| Governance is: | The structure of power, authority, and responsibility for certain fisheries or areas, and the overarching processes established to carry out fisheries management. This includes the governance structures and processes established by law, as well as those established by norms and policy guidance. Governance relates to: <ul style="list-style-type: none">• Who is responsible for determining how management decisions are made? Which group(s) are responsible for management of which species, in which areas?• Who decides what our overarching fishery management objectives are, what to do to pursue them and with what means?• How do we define the relationship between different management groups in the decision-making process?• Who is (or should be) ultimately accountable for management decisions? |
| Management is: | Management concerns the plans, actions, and strategies that are carried out to support sustainable management of fisheries. For management, we can consider: <ul style="list-style-type: none">• What are the management objectives for specific management bodies, management plans, or fisheries?• What actions are taken to pursue these management objectives?• What are the processes that are carried out to manage particular species or ecosystems? |

Given the above, this theme will address the way that our current governance system is structured, including the authority for management in different jurisdictions, and how different entities work together (or don't) to manage species within and across jurisdictions.

This theme contains a number of complex issues to discuss and resolve. Accordingly, we have broken up the theme into four organizing questions. For some of these questions, we have highlighted some examples of how this challenge is currently being addressed in one region or in a specific way. We then identify several potential actions that have previously been suggested as ways to address the challenges (or at least make progress) in future. Please note: these potential actions are merely suggestions. At the Summit, participants will be asked to review and assess these, and also suggest others that could be useful. Finally, participants will be asked to identify practical next steps to help take forward the most important ideas.

Organizing Question 1: What is the best structure and representation for governance on the U.S. East Coast?

Who should do what, and where, for which species? Should we reconsider the structure of regional Council management, the division of responsibilities for managing in state and federal waters, the role of the various offices of NMFS, coordination among states, or other governance issues?

Organizing Question 2: When and how should management authority change?

Should triggers be developed to reconsider management authority in response to changing conditions? What should the mechanism for transfer of authority look like?

Organizing Question 3: How can we improve the efficiency and the efficacy of joint fishery management plans?

How could we improve the joint management process? Should we be moving toward more or fewer joint management plans?

Organizing Question 4: How can we improve coordination and collaboration among management entities?

Aside from joint FMPs, there is a spectrum of ways that different groups coordinate with each other to develop management plans and share information. What approaches are working well or not working for coordinating management, resources, and information among multiple entities? How can we improve this coordination, and what should we move away from?

Positioning Cross-Jurisdictional Governance in the Future

Through previous phases of this initiative, managers and other stakeholders have made clear their concerns that our current governance structure may not be sufficiently robust to possible future conditions associated with the previously created scenarios.

One aspect of the scenarios considers how science will be able to inform our understanding of the changing environment and changing resource dynamics. Input from previous phases of this process indicates a lot of interest in trying to ensure that science is well equipped to provide us with information about changing conditions and stock distributions. However, we also need to consider how our governance and management structure might fare in situations where our science is less reliable and

less able to keep up with our management process in a timely manner. Managers have expressed concern that in these scenarios (the left-hand scenarios; Ocean Pioneers and Stress Fractures), decisions may be driven by politics if there is insufficient information to base decisions on science. On the other hand, even with “good” science and ability to assess ecosystem changes, that does not necessarily mean management will know what to do with that information or every management jurisdiction will want to apply it the same way. Successful inter-jurisdictional governance and management 20 years from now will depend on how much each management entity is on the same page about how to coordinate and respond to new science and data streams.

In terms of stock abundance, the vertical axis for the scenarios, it is recognized that the scenarios where stocks are healthy and abundant are likely to lead to different inter-jurisdictional governance challenges compared to the scenarios where stocks are declining. In the upper scenarios, (Ocean Pioneers; Checks and Balance), healthy and abundant stocks may be more likely to expand into new areas and increase in abundance at the edges of their distribution. Our governance structure will need to be able to address: who gets access to these new fish? Who is responsible for assessing and conserving these stocks? In scenarios where stocks are declining (Stress Fractures; Sweet and Sour), decreased abundance may lead to more turf guarding, and more focus on which communities are most dependent on a dwindling resource. Managers have expressed that in these scenarios, there may be sharper division between winners and losers.

In addition to the axes of uncertainty considered in the scenario framework, there are several other uncertain factors that might impact cross-jurisdictional governance and management over the next 20 years. For cross-jurisdictional management in particular, the potential for reauthorization of the Magnuson Stevens Act (MSA), and the changes that may be reflected in such a reauthorization, remain a major uncertainty. For the purposes of this scenario planning initiative, it is worth imagining the future possibilities relative to the MSA to inform our recommendations: ranging from no or minor changes to the MSA, to a full-scale overhaul of the law.

Learning from the Past

To set the stage for discussing this issue, particularly inter-jurisdictional governance structure and coordination between management entities, it is useful to briefly consider our current systems of governance and coordination. The tables below provide a non-comprehensive list of examples of different ways that East Coast management bodies are working together to manage marine fisheries. We acknowledge that some of these methods have been more successful than others and think this is an important thing to consider when imagining a future governance system that would best serve us in an era of climate change.

Management Authority Transfer and Joint Management Plans

| Topic | Example(s) | Advantages/ Efficiencies | Disadvantages/ Inefficiencies |
|---|---|--|---|
| Transfer of Management Authority | <ul style="list-style-type: none"> Cobia (Transfer from SAFMC to ASMFC) Red Drum (Transfer from SAFMC to ASMFC) | <ul style="list-style-type: none"> More efficient regulatory process/more flexibility to manage fisheries for timing of the fishery Easy to bring new states to the table as Cobia are landed to the north | <ul style="list-style-type: none"> Federal measures don't fully match up with states Transfer to Commission results in loss of some Magnuson protections/requirements, such as Essential Fish Habitat requirement. May create workload/resource issues for management body taking over authority SAFMC involvement w/ cobia still required for cooperative management with Gulf Council |
| Joint Fishery Management Plans: Two Councils | <ul style="list-style-type: none"> Monkfish (NEFMC and MAFMC) | <ul style="list-style-type: none"> Broad stakeholder representation for both New England and Mid-Atlantic fisheries | <ul style="list-style-type: none"> Separate meetings are inefficient; can result in different recommendations Northern and Southern fisheries are quite distinct Data limitations have exacerbated some joint management struggles |
| Joint Fishery Management Plans: Council and ASMFC | <ul style="list-style-type: none"> Summer flounder, scup, and black sea bass (MAFMC and ASMFC) Bluefish (MAFMC and ASMFC) | <ul style="list-style-type: none"> Broad stakeholder representation Decisions are made together for fisheries that occur in both state and federal waters; generally, balances interests of Council and Commission More people at the table to generate ideas and evaluate decisions from multiple angles | <ul style="list-style-type: none"> Need to reconcile separate regulatory processes, differing management priorities, and differing staff capacity Joint meeting approach creates large combined decision making body; can be cumbersome and lengthen action timelines Potential for unequal representation/voting power when parts of fishery is outside of the Council's jurisdiction |
| Joint Management: Two Councils and the ASMFC | <ul style="list-style-type: none"> Spiny Dogfish (Joint FMP between the NEFMC and MAFMC; Complementary FMP at ASMFC) | <ul style="list-style-type: none"> All areas have a vote on the issues | <ul style="list-style-type: none"> Can end up with different recommendations due to meeting separately Time consuming to have each body meet on its own schedule; lengthens timeline for actions Conflicting regs between state and fed waters Can end up with over-regulation |

Other Types of Coordinated Management

| Approach | Example (s) | Advantages/ Efficiencies | Disadvantages/ Inefficiencies |
|---|--|--|--|
| Coordination of scientific information and advice | <ul style="list-style-type: none"> • Blueline Tilefish (SAFMC and MAFMC) | <ul style="list-style-type: none"> • Coordinated assessment information and catch advice reduces chance of overfishing. • Independent management processes/decisions lead to more efficient decision-making process. | <ul style="list-style-type: none"> • Management is separate across regions: differing regulations/management approach across Council regions could be confusing for stakeholders; possible compliance and enforcement issues • Some stakeholders need to track two separate processes/sets of measures |
| Complementary management plans | <ul style="list-style-type: none"> • Atlantic Herring (NEFMC and ASMFC) | <ul style="list-style-type: none"> • Coordinated assessments; coordinated quotas. • Allows for independent state management with all states involved in the process. | <ul style="list-style-type: none"> • Can lead to differing measures in state and federal waters or different fishery priorities/objectives. • Inefficient at times due to meeting independently. |
| | <ul style="list-style-type: none"> • American Lobster (ASMFC and NOAA Fisheries) | <ul style="list-style-type: none"> • Independent management processes/decisions lead to more efficient decision-making process; states can move in/out of fishery as stocks change | <ul style="list-style-type: none"> • Federal waters can be slower to respond due to additional regulatory requirements |
| Council liaisons/non-voting members | <ul style="list-style-type: none"> • Councils can designate liaisons to attend and report back on activities of other Councils. • The ASMFC is represented in a non-voting role on each Council. | <ul style="list-style-type: none"> • An existing process that provides an opportunity to further expand representation and coordination | <ul style="list-style-type: none"> • Not all Councils have liaison for all other Councils. • Liaisons are non-voting at full Council level; may have limited influence. • Liaisons may not be able to express viewpoint of their Council if their Council has not yet addressed an issue. |

| Approach | Example (s) | Advantages/ Efficiencies | Disadvantages/ Inefficiencies |
|---|---|--|--|
| Representation of other regions on committees | <ul style="list-style-type: none"> • Atlantic Scallops (2 Mid-Atlantic Council members sit on New England scallop committee) • Summer flounder, scup, black sea bass (3 New England Council members sit on committee) • Mackerel Cobia (2 Mid-Atlantic Council Members serve on the Committee) • Dolphin Wahoo (2 Mid-Atlantic Council Members and 1 New England Council Member serve on the Committee) • Snapper Grouper (2 Mid-Atlantic Council Members serve and vote on the Committee) | <ul style="list-style-type: none"> • Allows for more representation of other regional or stakeholder interests. • Relatively easy and efficient way to increase representation and addressing changing needs of fishery by region. • Does not require changes to MSA. | <ul style="list-style-type: none"> • Committees are not always used the same way in each region; some get more use. Some regions make most decisions by Committee while others do not. • Committee members that are not on the Council do not participate in the final Council vote. |
| Changes in representation at Commission level | <ul style="list-style-type: none"> • States can declare an interest in emerging fisheries (e.g., New Hampshire with black sea bass), and can declare out of a fishery when they are no longer within state waters | <ul style="list-style-type: none"> • Efficient and flexible process • Commission has a de minimis designation that may be beneficial when species mostly move out or are just emerging into of an area | <ul style="list-style-type: none"> • De minimis is not recognized in federal plans, can lead to differing regulations in joint plans. |

Potential Actions: Cross-Jurisdictional Governance

Participants in the small group manager sessions and Council/Commission meetings raised a number of ideas and considerations related to inter-jurisdictional governance and management. The following tables summarize many of the suggestions from previous phases of this process. Not all of the elements of the tables have been filled out by the core team - summit participants will be encouraged to review and discuss these suggestions, consider their pros and cons, and contribute any additional potential actions.

What is the best structure and representation for decision making on the U.S. East Coast? What would you do if MSA is not constraining?

| Potential Actions | Considerations | | | |
|---|----------------------------|---|---|--|
| | Advantages | Disadvantages | Barriers | Needs |
| Consider managing by species group or trophic level instead of region | | | Existing Council management structure reflects the social and functional nature of the individual regions | |
| Ecosystem based fishery management by area, potentially instead of regional councils | | | | |
| Consolidate management authorities (e.g., one Atlantic Coast Council that has adaptive regions) | | | | |
| Convert more management plans to joint FMPs | Within current authorities | Tradeoffs between efficiency and public input | | Need to make joint decisions faster/streamline process |
| Move away from joint management plans and instead redesign the governance structure for better representation | | | | |
| Extend management under an existing FMP to cover the range of the stock with managing Council maintaining true lead | | | | |
| Revisit determinations of stocks in need of conservation and management (i.e., can you "give up" managing a particular species if depleted beyond the ability of management to impact?) | | | | |

How can we improve joint/shared management when there's more than one management entity?

| Potential Actions | Considerations | | | |
|--|--|---|--|--|
| | Advantages | Disadvantages | Barriers | Needs |
| Input on NMFS 304(f) guidance | Opportunity for Councils to come up with plan first with NMFS guidance as more of a backstop | | | Consider range from informal to formal, or informal testing before formal change |
| Review joint management plans and processes; identify opportunities for streamlining and increasing efficiency | A comparison of joint management processes would help to identify best practices and pitfalls to avoid | May be time and resource intensive, especially if conducted for all joint plans at once | Each group has their own operating procedures, legal requirements, and preferences. May be difficult to agree on best approaches. More people involved can make process more cumbersome. | Consider how we define joint management, as well as what is required under current legislation and which aspects are flexible. |

How can we improve coast-wide management by one management entity (e.g., Dolphin/wahoo, mackerel)? How do we improve coordination/collaboration among management entities?

| Potential Actions | Considerations | | | |
|---|--|--|--|-------|
| | Advantages | Disadvantages | Barriers | Needs |
| Reconsider Committee representation and use of Committees | Representation can be modified as managed species distribution changes. Tested method with Dolphin Wahoo and Mackerel Cobia FMPs | | Each Council and the ASMFC have their own established procedures and norms | |
| Reconsider AP representation (e.g., range of geographic representation) | Representation can be modified as managed species distribution changes. Tested method with Dolphin Wahoo and Mackerel Cobia FMPs | Could create mismatch with Council/Commission representation | | |
| Reconsider SSC representation, e.g., having one or more SSC liaisons between Councils | | | | |
| Identify mechanisms for increased collaboration between different NMFS regions (science centers and regional offices) | | | | |
| Evaluate distribution of resources within NMFS regions to different Council regions/species | | | | |

How do we transition management authority between/among management entities?

| Potential Actions | Considerations | | | |
|--|--|--|---|---|
| | Advantages | Disadvantages | Barriers | Needs |
| Provide input on NMFS 304(f) guidance | Range from informal to formal, or informal testing before formal change | | Turf wars/turf guarding - particularly with changes in management structure having implications for managers jobs. Desire to hang on to history (allocation fights, long-standing management systems, etc.) | Consider how flexible and nimble the transfer process should/should not be, and the ideal timeline. Also, what is the degree of input desired from affected management bodies, affected stakeholders, and the general public? |
| Develop triggers for reconsideration of authority (biological, distribution, habitat, economic, and other factors) | Systematic way to evaluate transfer of authority could increase transparency in the process, prevent surprises and potentially lessen influence of politics. | Availability, reliability, and timing of data for evaluating triggers may be insufficient or variable by region. | Major challenge to reach agreement on triggers across regions. Councils/Commission are not ultimate decision maker for authority defined by MSA. | |
| Evaluate potential costs and administrative/process needs for authority transfer | Clarifies tradeoffs to consider in management transition (e.g., staff resources needed; loss of institutional knowledge/expertise) | May be difficult to accurately assess/predict | | |
| Develop guidelines for how fishery access/permitting should or should not change in response to revised management authority | | | | |

Theme 2: Managing Under Increased Uncertainty

Overview

The summit is an opportunity to really think about what we can do to manage fisheries successfully no matter what the future brings. Most of the expertise in the room will be managers (with a few scientists also in attendance); thus, we intend to focus the conversation on management during the limited time available. We know you have great ideas on how to improve NMFS' science enterprise. We will discuss data and partnerships in Theme 3 below. In addition, we have set aside a section of the room to receive your ideas on improving stock assessments and the stock assessment enterprise. We pulled from the excellent ideas we already heard at the and are hoping you will expand on those ideas and provide more. We will share these with the stock assessment experts after the summit.

Managing under uncertainty is challenging. We heard a lot from you on these challenges during the council and commission discussions, and we agree. During the summit, we need to get to actionable items. We have provided a few ideas below that we heard from you or that the core team created. Some will be easier to implement than others. We are looking forward to hearing your thoughts on how we can best move forward.

What the Scenarios Tell us About this Challenge

Relative to all future scenarios, we have some givens: water temperatures will continue to warm, other ocean uses will increase. With the warming waters, some species will shift in distribution, and species/ecosystem productivity could also change. Increasing ocean uses will lead to spatial conflicts with other ocean uses. Scientific methods that rely on using the past to predict the future will no longer be appropriate in many situations.

There are two main approaches to dealing with uncertainties in fisheries management: first, increase investment of time and funding into research and science to better understand the situation and potentially decrease uncertainty in predictions (moving towards the right side of the matrix), and second, create management approaches that will have a good likelihood of being successful even with uncertainty (here, we are on left side of the matrix). Given that conditions on both sides of the matrix are plausible, we need to prepare for all situations.

Looking across all scenarios, in addition to planning for uncertainty, being able to respond quickly to change (at management and stakeholder/community levels) will be both useful and necessary. Where science can predict and track changes (right side of the matrix), managers and stakeholders may be able to prepare for the coming changes (creating if/then structures to reduce response times). Where science is less able to predict and track changes, managers and stakeholders will need to be nimble as stocks shift, collapse or exhibit other unpredicted changes. See below for more on these ideas.

Over the next 20 years, we expect there to be technological advances in data collection and analyses. We can expect progress on the science side, for example better predictions of species distributions, new stock assessment techniques with dynamic reference points, etc. We can expect better oceanographic models that will be able to help us better understand climate change impacts across the ocean, but we will likely still have surprises. We may also expect better coordination among management bodies that have similar management authority. We should keep this in mind as we discuss potential next steps.

This theme contains a number of complex issues to discuss and resolve. Accordingly, we have broken up the theme into three organizing questions. For each question, we have highlighted some examples of how this challenge is currently being addressed in one region or in a specific way. We then identify a number of potential actions that have previously been suggested as ways to address the challenges (or at least make progress) in future. Please note: these potential actions are merely suggestions. At the Summit, participants will be asked to review and assess these, and also suggest others that could be useful. Finally, participants will be asked to identify practical next steps to help take forward the most important ideas.

Organizing Question 1: How can we increase flexibility, adaptability, and robustness in management?

Idea: Establish adaptable management, frameworks and triggers

Here, we envision expanding the use of management frameworks (or other structures) that rely on if/then situations, where management changes are automatically triggered when certain environmental or fishery conditions occur. Establishing such structures should lead to greater nimbleness and speed around management changes. We acknowledge that creating and working within such structures is likely to be challenging in practice. Note that we can set up a formulaic way to share fish but this will not always account for future social/economic conditions. The realities of MSA, APA, NEPA and other statutes can also make this idea challenging.

Learning from past experiences:

- The Bering Sea and Aleutian Islands FMP includes pre-arranged “if/then” allocations for yellowfin sole between two sectors depending on the total allowable catch (TAC). If the TAC for the two sectors is greater than 125,000 metric tons (mt), then the first sector is allocated 60 percent; if the TAC for the two sectors is less than 125,000 mt, then the first sector receives an increasingly larger share.
- NEFMC NGOM scallop allocations and MAFMC commercial state summer flounder allocations are other similar examples.

- The US/CAN Transboundary Resource Assessment Committee (TRAC) sets allocations for cod, haddock, and yellowtail flounder based on a formula that accounts for historical use and current distribution.
- Councils can establish situations where a NMFS Regional Administrator has the authority to implement a time sensitive action without needing to go to the Council. For example, Amendment 9 to the SAFMC's shrimp FMP allows the Regional Administrator to close the shrimp fishery if temperature drops below 48oF and states request the closure.
- When investigating a dynamic ocean management tool, the SWFSC found that "dynamic closures could be 2-10 times smaller than existing static closures while still providing adequate protection for endangered non-target species". To date, research has shown this to be a viable option, but it has not yet been approved by a council or NMFS. Similarly, NFWF has funded a project to look at how communication around bycatch hotspots can decrease catch of non-target species.

Potential actions suggested in previous discussions:

- Use simulations, MSEs, or structured decision-making to test management actions for robustness and better understand trade-offs. Create guidelines for using MSEs (or pseudo-MSEs) in the management process.
- Look for and work to avoid carrying institutional baggage, i.e., the things we do because we have always done them that way, but could be restructured. When evaluating actions, assess if the action will increase or decrease future adaptability and flexibility if any of the scenarios come to pass.
- NEPA analysis will still be needed for these regulations. Councils will need to work with Regional Offices and General Counsel to evaluate ways to streamline the amendment development and regulatory process (NEPA, APA, MSA, etc) while meeting legal requirements. We have heard concerns that different regions have been given different advice.
- Given expected increase in other ocean uses, managers may need to increase flexibilities around changing gears. Managers should consider if there are gear restrictions that can be removed, or other flexibilities that can be added.

Organizing Question 2: How can we better accommodate uncertainty in the stock assessment process and address related management challenges?

As noted above, updating the science to support management is also very important. However, we want to focus here on where management has control. For stock assessments, this is the interface between assessments and the Councils/Commissions. Below we expand on two ideas we heard from stakeholders and managers. Both ideas are related to the idea of risk: How much of a "risk of overfishing" or "risk of foregone yield" is acceptable? What are the other risks of

Council/Commission action or inaction on economic and social systems (fishing communities), ecosystems and habitats?

Idea: Make better use of risk policies

Many RFMOs have existing risk policies. Risk relates to both the probability of an event occurring, and the severity of expected outcomes. Risk policies identify the bounds of how risk tolerant a management body should be given certain criteria. These policies inform and work in conjunction with harvest control rules. Existing risk policies might be based on assumptions of stationarity. Do these need to be re-assessed given expectations of non-stationarity in marine populations and ecosystems?

- One potential action could be to compare Council/Commission risk policies to understand pros and cons of different approaches. A report summarizing risk policies at the eight fishery management councils is forthcoming and will be shared by NEFMC once finalized; the Commissions and international examples will not be included in the report. Beginning in 2023, NEFMC plans to review and consider changes to its risk policy, informed by the forthcoming report.¹
- ASMFC has created a draft Risk and Uncertainty Decision Tool that consists of a series of questions related to the risk and uncertainty of a species' management. Questions fall into the following four categories: stock status, additional sources of uncertainty, additional risk considerations, or socioeconomic considerations. Criteria for responding to the questions may be quantitative or qualitative, and may be singular scores or indices composed of multiple pieces of information.
- Councils and Commission could also consider if it would be useful to align these policies to ensure that when species cross jurisdictional boundaries, the "rules" don't change completely.

Idea: Understand what uncertainties are accounted for in assessments, and how these relate to other management considerations such as impacts on fishing communities, ecosystems, or habitats

Understanding what types of uncertainty are accounted and not accounted for within assessments and other science advice is needed. Where science cannot directly account for important sources of uncertainty, can qualitative information be used to make decisions? These uncertainties will influence the catch advice that is developed from these assessments. The Councils/Commission account for many other factors when setting catch limits, including economic and social conditions in the fishery. A key idea here is communicating clearly around what uncertainties are or are not accounted for.

¹ For more information, see: <https://www.nefmc.org/library/january-2023-council-risk-policy> and <https://www.nefmc.org/library/january-2023-addressing-uncertainty-in-council-decision-making>.

Learning from past experiences:

- NPFMC uses risk tables as a qualitative way to clarify what uncertainties are included (or not) in a stock assessment (see **Appendix 3**).
- Collectively/systematically consider existing successful data poor assessments to see if we can identify takeaways about approaches that work under uncertainty.

Potential actions suggested in previous discussions:

- If quantitative stock assessment models are less likely to be accurate due to environmental changes, are there qualitative tools we can use instead? Potential tools to investigate include (likely in combination): structured decision making, local ecological knowledge, CPUE, survey data, etc.
- Consider using risk assessments (different from risk policies) to better understand risks and identify areas in need of research and management attention. MAFMC uses an EAFM Risk Assessment as part of their Ecosystem Approach to Fisheries Management. The risk assessment is a semi-quantitative tool that looks at ecological, economic, and social-cultural indices to understand what could impact the ability of a fishery to meet its management goals and objectives.
- Consider climate-friendly harvest control rules. A recent scientific paper found threshold F rules fared better under a changing climate (for most but not all stocks). These harvest control rules identify at least two biomass thresholds for determining appropriate fishing mortality rates: a target value below which fishing mortality is reduced and a limit value below which fishing mortality is prohibited.
- How do we address situations where what fishermen are seeing doesn't align with survey catches or assessments? For example, when CPUEs in the fishery are high, but survey catches are variable, or low. How do we know which species respond to decreased abundances by increasing congregation (= flat CPUE as stock abundances tank)?
- Are there simple ways we can gather needed data to answer questions around problematic issues/questions? For example, to better estimate natural mortality rates.

Organizing Question 3: How can we improve the ability for fishermen and other stakeholders to adapt to climate change?

Idea: Review existing permit/quota/allocation systems to see how they can be more adaptable and flexible, including across regions and organizations

Our existing permit system keeps putting fishermen in smaller and smaller boxes, where they are highly specialized and dependent on one or a few fisheries. How can we reverse this and give fishermen more flexibility in their fishing?

Allocations can be specified based on multiple categories, including commercial vs. recreational, state by state, gear by gear, FMP by FMP (bycatch vs. target). Can we consider allocations through a community/climate lens? For example, are specific communities losing as climate causes shifts in species?

Are there limitations at the dealer level that make adaptation challenging?

Learning from past experiences:

- Researchers from California are currently looking around the world and compiling examples of permit systems that are more flexible and adaptable. This analysis could be really informative.
- There are many barriers to addressing this challenge. At the top of the list is that industry members have invested significant sums of money to acquire their current permits. We cannot solve the permit challenges today, but we can identify steps in a process that could lead to an improved system.
- See TRAC discussion above.

Potential actions suggested in previous discussions:

- Splitting permits, adding new species to existing permits, allowing fishermen to swap species on a permit, removing historical moratoria on new permits for species doing well.
- Landing requirements and location of infrastructure (processing facilities, other) is also important and needs to be part of the conversation.

Theme 3: Data Sources and Partnerships

Overview

One of the primary axes used to develop the scenarios was based on the predictability of ocean conditions, which includes how well science is able to assess and predict changes in stock production and distributions. While the first two themes are centered on how to handle cross-jurisdictional issues and evolving the decision-making process to handle uncertainty, this theme focuses on our ability to provide the information necessary to do both. Providing information about stocks and their locations hinges on our ability to evaluate accurate and timely data. This theme asks, "How do we better coordinate our data collection systems and develop partnerships to leverage existing funding?" As we work through this theme it is important to keep the "existing funding" in mind. While the possibility of increased funding levels could materialize, we should focus our strategies on maximizing our current resources. Coordination between management entities, federal entities, academic partners, fisheries stakeholders, and other ocean users will play a large role in which side of the axis we find ourselves within the scenario framework.

This theme contains a number of complex issues to discuss and resolve. Accordingly, we have broken up the theme into four organizing questions. For each question, we have highlighted some examples of how this challenge is currently being addressed in one region or in a specific way. We then identify several potential actions that have previously been suggested as ways to address the challenges (or at least make progress) in future. Please note: these potential actions are merely suggestions. At the Summit, participants will be asked to review and assess these, and also suggest others that could be useful. Finally, participants will be asked to identify practical next steps to help take forward the most important ideas.

Organizing Question 1: How should we prioritize data/information needed to manage in a changing environment?

The next generation of stock assessments and the ability to perform climate ready management will hinge on our ability to have the right mix of data/information available to scientists and managers. As we plan for the future we will need to determine what data/information to prioritize, as well as consider what can be accomplished at the national or regional level and what needs to be addressed on a council by council basis. Some of the data and information we need will be readily available while others will need a plan for how to collect and synthesize.

Learning from past experiences:

- NOAA Fisheries has taken steps to modernize its data acquisition plan through the Next Generation Data Acquisition Plan ([NG-DAP](#)). This plan is expected to support nationwide data acquisition and guide NOAA toward a more holistic climate-focused, ecosystem-based management approach.

- The Mid-Atlantic Fishery Management Council has used the results from their Ecosystem Approach to Fisheries Management Risk Assessment ([EAFM Risk Assessment](#)) to analyze the highest risk interactions for each species and identify strategies for addressing these risks.

Potential actions suggested in previous discussions:

- Convene workshops to determine what data will be needed to manage stocks in a changing environment 20 years from now and focus efforts.
- Adjust survey designs to accommodate new conditions and other ocean uses.

Organizing Question 2: How can we use current funding more efficiently?

While the perfect scenario would include a giant increase in funds available to manage our public trust resources, the prudent thing to do would be to plan on the best use of existing resources. Strategies need to be developed on how to efficiently allocate funds spent on data collection in order to maximize the data/information that are needed especially in a changing climate. Think about ways that funds can be leveraged with other users.

Learning from past experiences:

- The [Catch Accounting and Monitoring System](#) (CAMS) is a single comprehensive source for all Northeast U.S. commercial fisheries catch both landings and discards. Developed as a joint venture between the NEFSC and GARFO, CAMS will serve as a single source of data to be used in quota monitoring, stock assessments, protected resources bycatch estimation, ecosystem modeling, and other future needs.
- The [Atlantic Sea Scallop Research Set-Aside Program](#) funds multi-year surveys and other projects to provide recipients with more predictable funding.

Potential actions suggested in previous discussions:

- Focus on AI development to more rapidly get data into assessments.
- Better utilize existing data, e.g., eVTRs, observer data, study fleet.
- Update surveys to better capture shifting stocks.
- Develop more consistent funding sources. Year to year uncertainty impacts ability to best use funds to manage stocks.

Organizing Question 3: How can we better utilize the fishing industry for data collection?

A common theme that arose during the development and application phases was the need to collect more fishery dependent data and to better utilize those data in assessments and management in a timely manner. Integrating the science with what industry is seeing on the water would help develop trust between science and industry partners. There are many data streams that should be more readily ingested by the management process. Here we want to think about what steps can be taken to provide industry with the tools to more directly and formally provide usable and timely data.

Learning from past experiences:

- The [Northeast Fisheries Science Center Study Fleet](#) originated in 2006 to engage fishermen in collecting high resolution data to address science and management needs.
- The [eMolt](#) program (Environmental Monitors on Lobster Traps and Large Trawlers) involves more than one hundred commercial fishing vessels on the Northeast Shelf that have oceanographic sensors installed on their fixed and mobile gear that feed data to both ocean models and stock assessment models.

Potential actions suggested in previous discussions:

- Work with the Science Centers to ensure that fishery-dependent environmental and fishery data are incorporated into the assessment process.
- Expand the study fleet and explore ways to better incorporate study fleet data.
- Expand capacity for combining traditional and industry-based surveys.

Organizing Question 4: What are the best ways to foster outside partnerships for sharing data, especially with other ocean users?

Fisheries managers are not the only ones interested in the state of the ocean. There are many outside entities that can be partnered with, including academics, non-governmental organizations (NGOs), and other ocean users such as offshore wind developers, aquaculture, and regular citizens. Fostering partnerships with these users may prove to be beneficial for all parties. As you contemplate this question, think about how we can work with other ocean users to collect, share, and evaluate mutually beneficial data, as well as what partnerships or agreements should be pursued to plan for the future.

Learning from past experiences:

- The [Integrated Ocean Observing System](#) is a national-regional partnership working to provide new tools and forecasts to improve safety, enhance the economy, and protect our environment. Integrated ocean information is available in near real time, as well as retrospectively.

- The South Atlantic Fisheries Management Council developed a [Citizen Science Program](#) under the guidance of a wide array of stakeholders and partners to build projects based on the Council's research needs.
- The Commercial Fisheries Research Foundation, in partnership with Rhode Island Department of Environmental Management, operates a [Black Sea Bass Research Fleet](#) in the Southern New England and Mid-Atlantic Bight region. The project employs commercial fishermen, utilizing a variety of gear types, to collect biological and fishery data on black sea bass throughout the year.

Potential actions suggested in previous discussions:

- Work with wind companies to collect environmental and biological data on wind turbines.
- Expand citizen science outreach.
- Develop Federal agencies Memorandums of Understanding (MOU) for data sharing.

Other Issues

Throughout the scenario process, several other topics were identified as potentially important issues to address in an era of climate change. While most of our time and attention will be focused on the three issues above, there will be opportunities for participants to discuss additional issues they feel are important, including the examples below if desired. This might involve making connections between them and the three main issues, or simply by considering such topics individually.

- Planning for the challenges associated with other ocean uses (wind, aquaculture) and the potential for spatial zoning to help with these challenges.
- Continuing movement toward ecosystem based fisheries management (EBFM), and the need to consider the importance of forage species.
- Ensuring adequate shoreside access and infrastructure for recreational and commercial fisheries.
- Increasing trust between stakeholders and managers, including improving communication on science and uncertainty.
- Protecting the edges of stocks that move into new areas or as new fisheries emerge.
- Consider the appropriate role of the Councils, Commission, and NMFS in creating and supporting markets for fishery products as conditions change.
- Planning for the aging of fleet.
- Understanding that politics (and litigation) can play a big part in fisheries management.

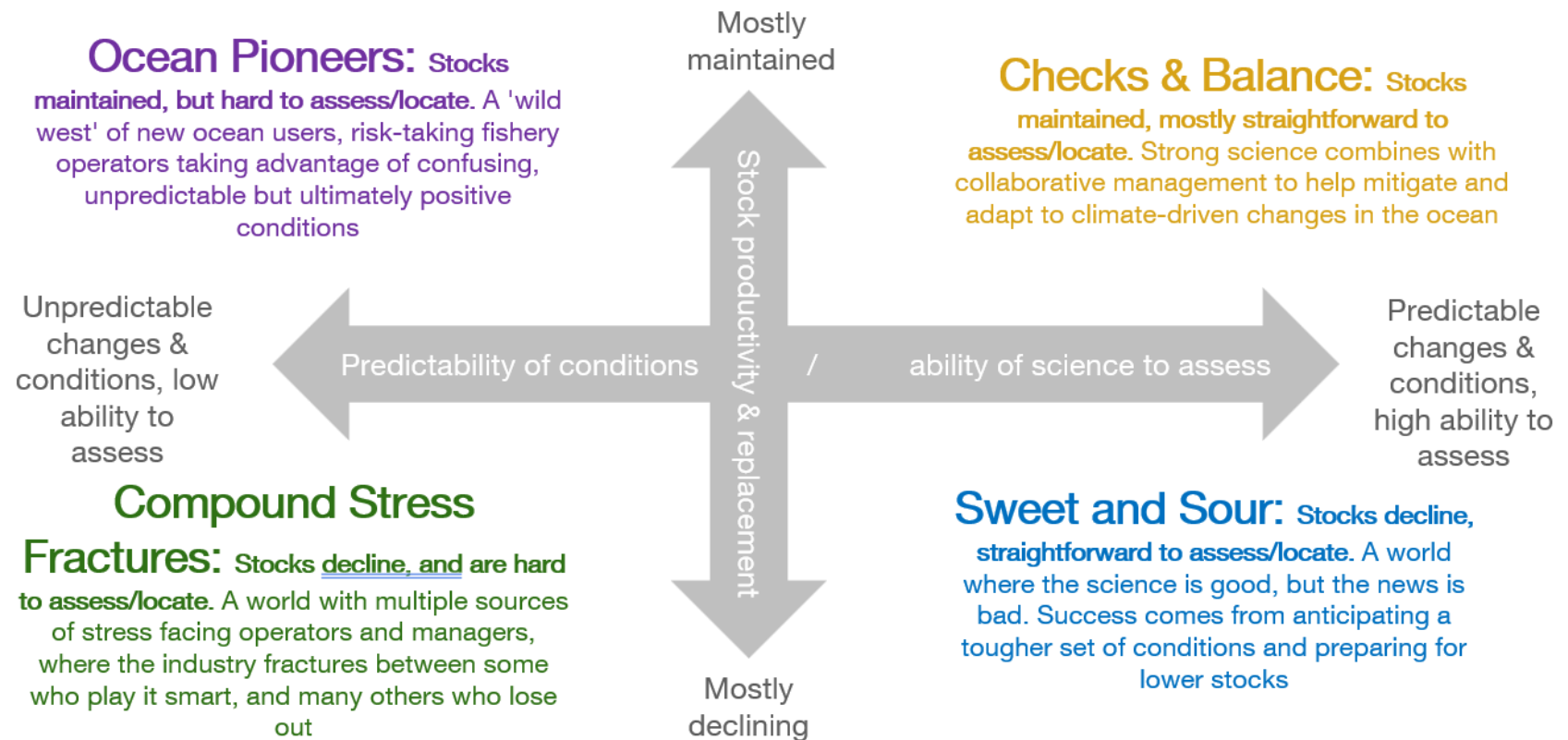
Conclusion

The summit is an amazing opportunity. We have managers from all four management bodies and NMFS together for two days to really think about what we can do to manage fisheries successfully as climate change continues to affect the oceans and stocks within it. Through several conversations and workshops in the scenario process, participants have identified what they see as the most promising ways to make progress. In the Summit Meeting, we want to take these ideas further, identify priorities, and decide on some practical next steps that can be considered by Councils, Commission and other stakeholders.

Thank you for your ideas to date, and we look forward to developing them further at the forthcoming meeting.

Appendix 1: Final Scenario Framework

For quick reference, the final scenario framework developed at the June 2022 scenario creation workshop and further refined during the scenario deepening process in Summer/Fall 2022. The full scenario narratives can be found [here](#).



Appendix 2: Recent Council and Commission Meeting Summaries

Below is a brief summary of the issues and ideas discussed by each Council/Commission in November/December 2022, along with some commentary of which issues were deemed most relevant and important.

Atlantic States Marine Fisheries Commission

The Commission took a somewhat pessimistic view of where we are today; with nearly all members agreeing that we are on the bottom half of the scenario framework with declining stock productivity and replacement. About a third of the members thought that conditions were unpredictable (Compound Stress Fractures), while the other third perceived somewhat more predictable conditions (Sweet and Sour). In looking to the future, Commissioners guessed that any of the scenarios might be possible, except for Checks and Balance where stocks are high and conditions are predictable. Reacting to the scenarios, Commissioners identified the need for flexible management response; building collaboration, trust and transparency among stakeholders at the table; incorporating politicians into the process, recognizing the impact of politics on decision-making; considering social and economic impacts and maintaining access for fishermen; developing stock assessment tools to account for changing environmental conditions; and evaluating what type of governance and management structure would lead to effective, nimble management as important themes.

It was noted that change is created by political action, judicial decisions, and management decisions. There is a fear that decisions will remain political or get more political - especially in light of scenarios with reduced ability to assess what's going on. Increased collaboration in the future could be tainted by desire to hang on to history (allocation fights, long standing management systems, etc.). Several Commissioners discussed the limitations of the Magnuson Stevens Fishery Conservation and Management Act (MSA) and that it was not designed around the expectation of climate change.

When considering important issues to address at the summit the following ideas were raised: creating a nimble structure that adjusts responsibilities to reflect changing ecosystem, resources and fisheries, including whether it is possible to do this through a revision to the MSA; finding ways to be agile and responsive to what we're dealing with and be less focused on past information; shifting to Ecosystem Based Fisheries Management (EBFM); finding funding sources to support flexible management and the tools need to create it; and developing tools that can account for changing environment and how to use those tools in a meaningful way in the process.

South Atlantic Fishery Management Council

The South Atlantic Council noted the importance of considering when to be proactive and when to be reactionary in reference to management, as well as regarding the need to involve other jurisdictions. The Council also noted turf wars are already occurring in the region between and within sectors. As climate changes and stocks shift or expand their range, there will be winners and losers. Members stated that a complication in the region is that the Southeast Fisheries Science Center and Southeast Regional Office serve three Councils over a diverse area, leading to capacity, support, and funding issues. In addition, the South Atlantic Council jurisdiction spans subtropical to temperate habitats from the Florida Keys to the North Carolina-Virginia border with some stocks being managed along the entire east coast and into the Gulf of Mexico. The Council described a need to identify and evaluate the full range of formal and informal mechanisms being used now to deal with cross jurisdictional issues and structure. Members noted that climate change may also require more people at the table to include more water quality and habitat expertise.

The Council discussed reviewing the joint plans of the Mid-Atlantic, to review how they are working and apply lessons learned. The Council proposed expanded coordination between Councils, instead of the current method of having one Council liaison between Councils. The idea to have all Council members participate to better represent the ideas of all Councils was discussed. The Council highlighted the need to review procedures for shifting jurisdictions and transfer of authority. As an example, the issue of possibly transferring authority of cobia to ASMFC came up quickly but the process took 3 years to accomplish with ASMFC still needing to coordinate between states and Federal management authorities. The Council also noted that a mechanism, regardless of structure, needs to be in place to address species crossing jurisdictional boundaries.

The Council's highest priorities for issues to address during the Summit include cross jurisdictional structure, making decisions with less clarity and greater uncertainty, and funding and attention to data and science which is directly linked to the stock assessment methods and process.

New England Fishery Management Council

The New England Council took a somewhat pessimistic view of where we are today; with nearly all members agreeing that we are on the left-hand side of the scenario framework with a low ability to assess stocks and make predictions. Approximately half of the members thought that stocks were currently mostly maintained (Ocean Pioneers), while the other half perceived declines (Compound Stress Fractures). Reacting to the scenarios, members expressed concerns that our science and management systems are insufficiently adaptable, and they will not be able to respond in a timely way that will allow us to address challenges. Others were more optimistic that we could develop science and management approaches to mitigate negative impacts, but underpinning this optimism was a sense that innovation, collaboration,

creativity, adaptability, and pushing current boundaries will be needed. Beyond shifting fish stocks, other ocean uses such as offshore wind and aquaculture and interactions with protected species were noted as issues that will further complicate prosecution and management of fisheries. Members observed that international fisheries agreements and the MSA may limit flexibility to adjust management systems.

When considering the most important issues to address at the summit, the New England Council ranked four issues highly: Cross-jurisdictional structure; funding and attention in data and science; stock assessment processes and methods; and increased flexibility around permitting and landings. Members agreed that modifications to cross jurisdictional structure would be triggered by changes in species distribution. They discussed the importance of appropriate representation in management bodies in relation to the geography of the stock and fishery, considering state, Federal, and international issues. It was acknowledged that joint management might be more resource intensive, unless simpler approaches could be developed.

Members observed that limitations in the stock assessment process and methods were related to finding a suitable balance of funding and attention to data and science. The need to evolve scientific methods, perhaps in significant ways, was acknowledged, and the importance of planning for transitions was noted. The concept of hedging our bets and investing in multiple different approaches was suggested as a robust approach given uncertainty about future outcomes. The importance of identifying long range goals and planning for the future was highlighted by a number of Council members.

The Council acknowledged the sensitivity around possible revision to permitting, but there was agreement that increased flexibility is important to provide. Some specific ideas such as permit splitting and multi-state landings programs were suggested. Identifying a vision for the fleet and framing the issue as one of survival for all industry members in the face of change, could be helpful.

Mid-Atlantic Fishery Management Council

The Mid-Atlantic Council agreed that our current governance and management systems would be strained under most scenarios but emphasized the need to be deliberate and cautious when considering potential changes. Members suggested working through some changes informally first, to test possible modifications and solutions, before formalizing governance changes that may be difficult to modify again. They also commented that it will be important for the Councils to think about potential processes and triggers for changes in management authority, as they should be part of the process of developing policy guidance that NMFS is currently exploring.

Among the other priority issues identified by the Mid-Atlantic Council were the stock assessment process and maintaining or enhancing funding and data streams. Council members expressed concerns about continuity in assessment data with continued

changes in ocean uses, survey ranges becoming more mismatched with species distributions, and decreases in basic data collection such as dockside sampling. The frequency and timing of assessments is already challenging, and Council members fear decreased stakeholder buy-in for science that may not match what fishermen are seeing on the water. Many Mid-Atlantic stakeholders are already skeptical of the science - as such, science communication and stakeholder outreach will need improvement if assessment methods and data sources continue to change.

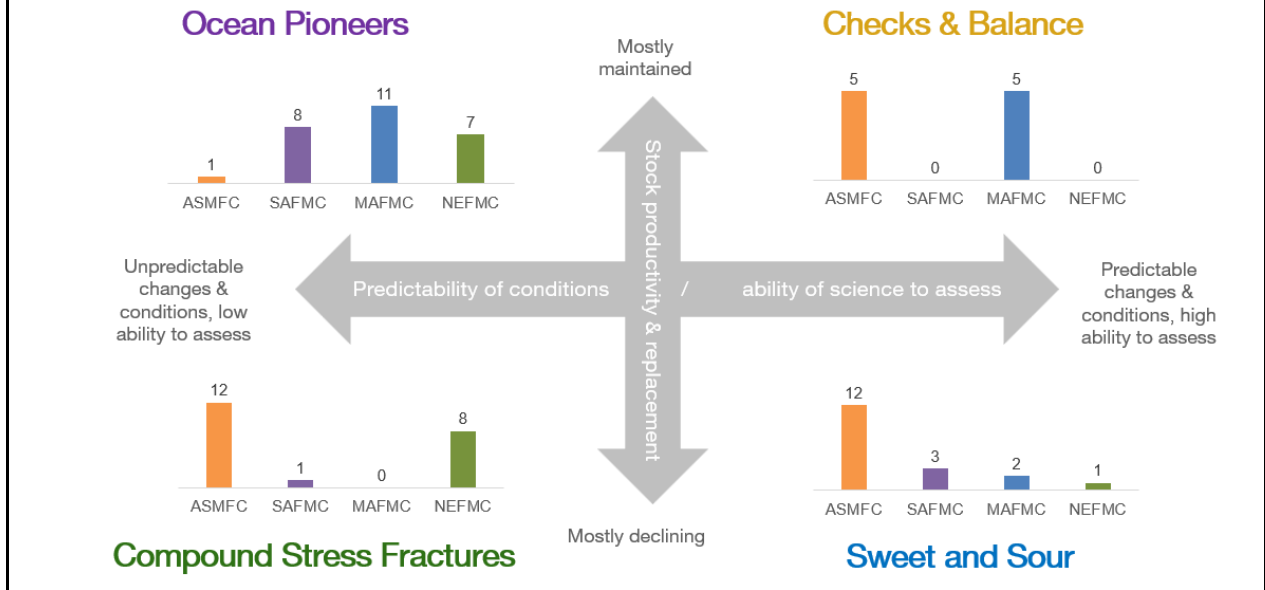
The Mid-Atlantic Council supported more collaboration in data collection and better leveraging existing platforms and partnerships, suggesting potential for efforts like enhanced use of study fleets or citizen science programs. Our current scientific processes would need to be more flexible and creative in finding ways to use this data, as well as generally adapting to manage with potentially less information. EBFM was raised as a potential for addressing some governance and management issues across multiple scenarios.

There is a need for the Council process to become more flexible, efficient, and nimble, and a need to recognize how past decisions have limited the fishing industry's adaptability. There are differences in different user group's abilities to take advantage of shifting stocks. There is also a need to recognize the business investments that have been made over several decades, under management and permit systems that the Councils designed.

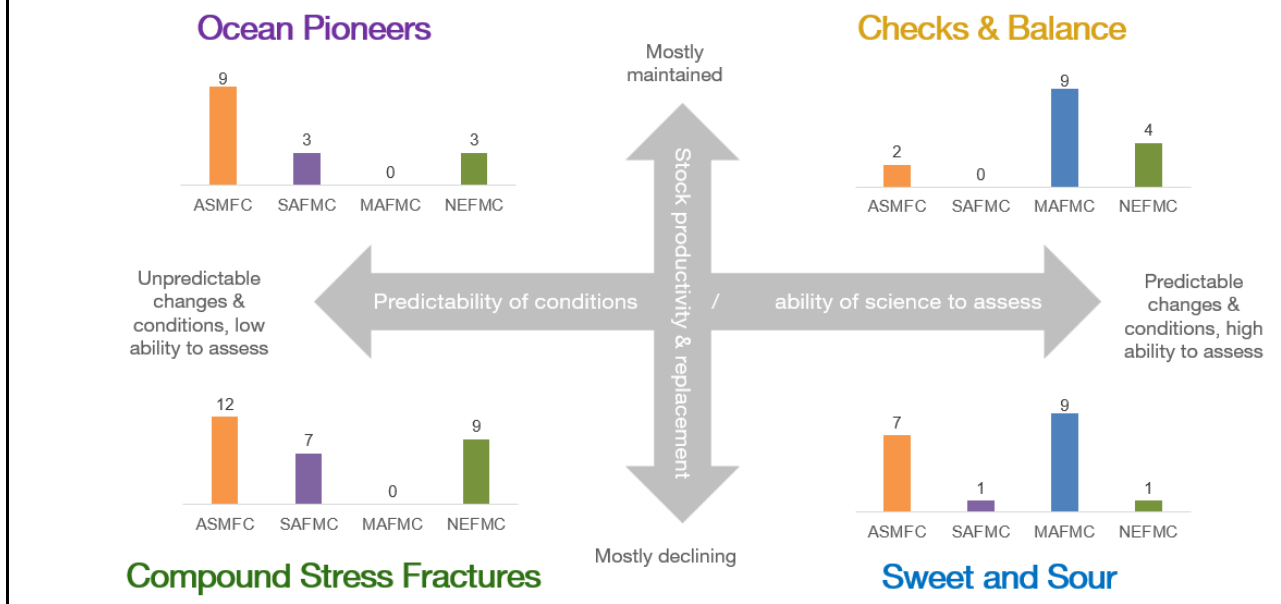
Poll Results and Identifying Key Themes

As part of the Council/Commission discussions, we asked participants for their views on how well the four scenarios described aspects of the current reality and future prospects. The figures below provide a vote tally in response to two questions: 1) which scenario is the closest to describing the situation as you see it today? and 2) which scenario do you believe is most likely to play out by 2042? It was clear from the discussions that each management body has a slightly different view of where we are today and where we might be in the next 20 years.

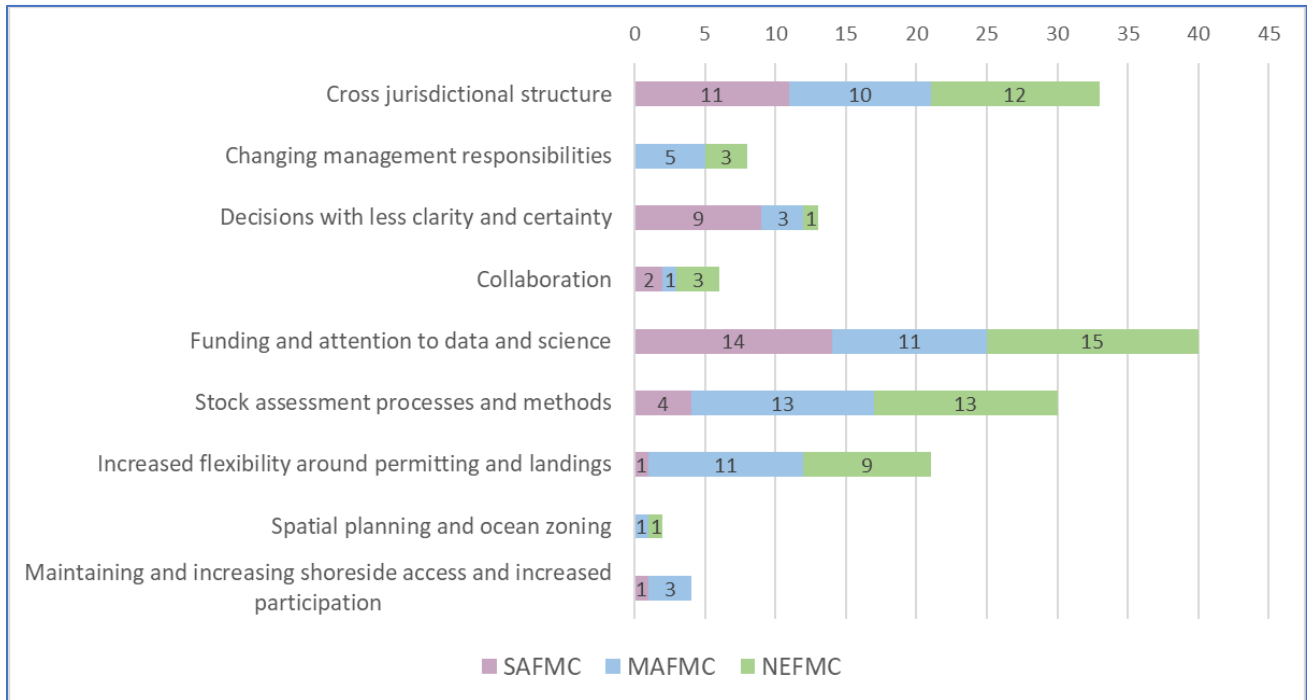
Which scenario is the closest to describing the situation as you see it today?



Which scenario do you believe is most likely to play out by 2042?



In addition to the questions about the scenarios, at the three Council Meetings, we asked Council members to vote for the issues that they felt should be discussed at the summit meeting (votes on these issues were not taken at the Commission meeting). The vote totals are shown below.



*At the Mid-Atlantic Council meeting, several members voted for a blend of “cross-jurisdictional structure” and “changing management responsibilities,” seeing these issues as highly interrelated. These votes were categorized as “cross jurisdictional structure” for the purposes of this figure. In addition, one Mid-Atlantic Council member voted for “Ecosystem Based Management” as an additional category.

Appendix 3: North Pacific Fishery Management Council Risk Tables

NPFMC uses risk tables as a qualitative way to clarify what uncertainties are included (or not) in a stock assessment. They have assessment scientists give a qualitative rank for three categories. If multiple categories have a high level of concern, the stock assessment scientists suggest an increase in the scientific uncertainty buffer. One of the categories is environmental/ecosystem considerations, and would include concerns related to a changing climate. Examples are provided below (Table 1 from Dorn and Zador 2020; Ecosystem Health and Sustainability).

Table 1. Risk classification table for assessment, population dynamics, and environmental/ecosystem considerations.

| | Assessment-related considerations | Population dynamics considerations | Environmental/ecosystem considerations |
|---|---|--|--|
| Level 1: Normal | Typical to moderately increased uncertainty; minor unresolved issues in assessment. | Stock trends are typical for the stock; recent recruitment is within normal range. | No apparent environmental/ecosystem concerns. |
| Level 2: Substantially increased concerns | Substantially increased assessment uncertainty or unresolved issues. | Stock trends are unusual; abundance increasing or decreasing faster than has been seen recently, or recruitment pattern is atypical. | Some indicators showing an adverse signals but the pattern is not consistent across all indicators. |
| Level 3: Major Concern | Major problems with the stock assessment; very poor fits to data; high level of uncertainty; strong retrospective bias. | Stock trends are highly unusual; very rapid changes in stock abundance, or highly atypical recruitment patterns. | Multiple indicators showing consistent adverse signals a) across the same trophic level, and/or b) up or down trophic levels (i.e., predators and prey of stock) |
| Level 4: Extreme concern | Severe problems with the stock assessment; severe retrospective bias. Assessment considered unreliable. | Stock trends are unprecedented. More rapid changes in stock abundance than have ever been seen previously, or a very long stretch of poor recruitment compared to previous patterns. | Extreme anomalies in multiple ecosystem indicators that are highly likely to impact the stock. Potential for cascading effects on other ecosystem components. |

Fishermen, managers, and scientists can be frustrated when stock assessments do not account for perceived increases in stock conditions (stocks that have increased their productivity in a changing climate). Councils and SSCs could consider if an additional column to qualitatively identify these “winners” could be used to allow more liberal catch limits when appropriate.

Expansion of NP idea to include identification of stocks that are increasing their productivity.

| | Assessment-related considerations | Population dynamics considerations | Environmental/ecosystem considerations | NEW? Positive response to ecosystem considerations |
|-----------------------------|-----------------------------------|------------------------------------|--|--|
| Level 1: Normal | | | | |
| Level 2: Increased concerns | | | | |
| Level 3: Major concerns | | | | |
| Level 4: Extreme concerns | | | | |