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FISHERIES

ATLANTIC HIGHLY MIGRATORY SPECIES
Ecosystem-Based Fisheries Management
Road Map Implementation Plan

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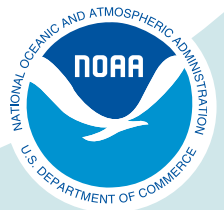
Atlantic Highly Migratory Species

Ecosystem-Based Fisheries Management Road Map Implementation Plan

2018–2022

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Sustainable Fisheries
Atlantic Highly Migratory Species Management Division



NOAA
FISHERIES

Ecosystem-Based Fisheries Management for Atlantic Highly Migratory Species Fisheries

Introduction

NOAA Fisheries has long recognized the importance of ecosystem-based fisheries management (EBFM). The EBFM Policy¹ and EBFM Road Map² describe how NOAA Fisheries implements EBFM based on six guiding principles. NOAA Fisheries defines EBFM in the policy as “a systematic approach to fisheries management in a geographically specified area that contributes to the resilience and sustainability of the ecosystem; recognizes the physical, biological, economic, and social interactions among the affected fishery-related components of the ecosystem, including humans; and seeks to optimize benefits among a diverse set of societal goals.” To implement EBFM, the policy identifies and outlines six guiding principles:

1. Implement ecosystem-level planning.
2. Advance our understanding of ecosystem processes.
3. Prioritize vulnerabilities and risks of ecosystems.
4. Explore and address trade-offs within an ecosystem.
5. Incorporate ecosystem considerations into management advice.
6. Maintain resilient ecosystems.

The EBFM Road Map calls for the development of implementation plans to guide NOAA Fisheries’ efforts in implementing EBFM over the next five years. The purpose of this implementation plan is to identify and coordinate priority EBFM milestones among the Atlantic Highly Migratory Species (HMS) Management Division of the Office of Sustainable

Fisheries, the Northeast Fisheries Science Center (NEFSC), the Southeast Fisheries Science Center (SEFSC), and our key partners.

The EBFM Road Map defines three time ranges based on need and availability of funding. Short-term actions are characterized as ongoing or already planned and funded by existing resources. Medium- and long-term actions may not be fully funded and, therefore, not immediately implementable. Regional implementation plans should assist in leveraging existing efforts and more effectively coordinating among them, in addition to supporting informed prioritization for funding decisions.

The EBFM Policy notes that ecosystem-based management (EBM) is not the same as EBFM. EBM is understood to cover all ocean-use sectors, beyond just fishery-oriented interests. EBFM supports NOAA’s broader goals for EBM across multiple sectors and mandates, but actions under the EBFM Policy and Road Map do not include other sectors such as ecotourism or oil and gas exploration.

Regional Context

Atlantic HMS—tunas, swordfish, billfish, and sharks—and their prey inhabit:

- The North Atlantic-wide convention area of the International Commission for the Conservation of Atlantic Tunas (ICCAT), within and outside of the U.S. Exclusive Economic Zone (EEZ).

1 <https://www.fisheries.noaa.gov/resource/document/ecosystem-based-fisheries-management-policy>

2 <https://www.fisheries.noaa.gov/resource/document/ecosystem-based-fisheries-management-road-map>

- Four Large Marine Ecosystems that include areas within the U.S. EEZ: Northeast U.S. Continental Shelf, Southeast U.S. Continental Shelf, Gulf of Mexico, and Caribbean Sea.
- U.S. federal and state waters.
- The jurisdictions of the Atlantic HMS Management Division, five regional fishery management councils, two interstate marine fisheries commissions, 21 U.S. states and territories, and 52 ICCAT contracting parties.

Atlantic tunas, swordfish, billfish, and some shark species are managed domestically by the Atlantic HMS Management Division in coordination with ICCAT. The ICCAT Standing Committee on Research and Statistics (SCRS) conducts stock assessments for those species, with participation from NOAA Fisheries science center staff. Other Atlantic shark species (e.g., large coastal, small coastal, smoothhound) are also managed by the Atlantic HMS Management Division, and stock assessments for those sharks are completed domestically by the Southeast Data, Assessment, and Review (SEDAR) process managed by SEFSC. In addition to stock assessments, SEFSC and NEFSC staff contribute to studies of Atlantic HMS for both U.S. and ICCAT management, including other issues related to EBFM.

A number of recent and ongoing efforts contributing to EBFM for Atlantic HMS, including those listed below, are efforts upon which future EBFM milestones could be built.

- ◇ Management of Atlantic HMS fisheries is conducted through one consolidated fishery management plan (FMP), which considers impacts on multiple species together, including Atlantic HMS, some council-managed species such as dolphin (mahi-mahi), and bycatch species.³

- ◇ The Atlantic HMS Management Division consolidates annual updates of the best available information and data on the status of HMS stocks, economic status of Atlantic HMS fisheries, and interaction with protected species and habitats in the Atlantic HMS Stock Assessment and Fishery Evaluation (SAFE) Report.⁴
- ◇ The 2006 Consolidated Atlantic HMS FMP and its amendments require bycatch reduction devices to minimize interactions with protected species, as well as measures to minimize discards and discard mortality of Atlantic HMS and other non-target species in a given fishery. All management measures to address bycatch are summarized annually in the Atlantic HMS SAFE Report.
- ◇ The Atlantic HMS Management Division performs trade-off analyses that consider interdisciplinary factors when developing measures in the 2006 Consolidated Atlantic HMS FMP and its amendments (e.g., bluefin tuna quota allocation, swordfish retention limits, changes to regional quotas, and permit structures for shark fisheries).
- ◇ The Atlantic HMS Management Division recently completed a comprehensive five-year review of Atlantic HMS essential fish habitat (EFH) which includes an analysis of fishing and non-fishing impacts to Atlantic HMS EFH.⁵
- ◇ The Atlantic HMS Management Division developed Atlantic HMS management-based research needs and priorities, including research on ecosystem-based stock assessments, higher-level EFH data, socioeconomic information, and the effect of climate change on the life histories of Atlantic HMS.⁶ The Division is developing an updated version of the research needs and priorities.

3 <https://www.fisheries.noaa.gov/atlantic-highly-migratory-species/atlantic-hms-fishery-management-plans-and-amendments>

4 <https://www.fisheries.noaa.gov/atlantic-highly-migratory-species/atlantic-highly-migratory-species-stock-assessment-and-fisheries-evaluation-reports>

5 <https://www.fisheries.noaa.gov/action/amendment-10-2006-consolidated-hms-fishery-management-plan-essential-fish-habitat>

6 <https://www.fisheries.noaa.gov/resource/document/atlantic-hms-management-based-research-needs-and-priorities>

- ◇ NOAA Fisheries developed Northeast, Southeast, and Gulf of Mexico Regional Actions Plans (RAPs) for the Climate Science Strategy that include Atlantic HMS considerations.⁷ Development of the Southeast RAPs was supported by a priority-setting workshop on climate variability and fisheries.⁸
- ◇ NOAA Fisheries and NOAA Office of Oceanic and Atmospheric Research developed a climate vulnerability assessment for the northeast that includes some Atlantic HMS (e.g., dusky, porbeagle, and sand tiger sharks and smooth dogfish).⁹
- ◇ The New England Fishery Management Council and NOAA Fisheries completed a management strategy evaluation process for Atlantic herring that considered the importance of the U.S. stock of Atlantic herring to bluefin tuna condition and their availability to regional fisheries. The council selected an Atlantic herring control rule based on the management strategy evaluation.¹⁰
- ◇ The Mid-Atlantic Fishery Management Council (MAFMC) considered the importance of Atlantic chub mackerel to the diets of Atlantic HMS as part of an amendment to add chub mackerel to their Atlantic Mackerel, Squids, and Butterfish FMP.¹¹
- ◇ The Atlantic HMS Management Division collaborated with the Atlantic States Marine Fisheries Commission on a habitat fact sheet for coastal sharks.¹²
- ◇ SEFSC conducts investigations on the importance of pelagic habitat characteristics to species such as bluefin tuna.¹³
- ◇ The Atlantic HMS Management Division and the Office of Science and Technology conduct studies on the socioeconomics of Atlantic HMS fishing communities, including activities related to for-hire fishing¹⁴ and angling.¹⁵
- ◇ NOAA Fisheries conducts studies on social indicators of fishing community vulnerability and resilience, including Atlantic HMS fishing communities.^{16 17 18}
- ◇ SEFSC and NEFSC further develop and refine ecosystem models examining the consequences of apex predator declines and their trophic role in marine systems.
- ◇ SEFSC and NEFSC determine habitat and environmental drivers of recruitment and abundance for sharks to improve stock assessments.
- ◇ SCRS completed ecological risk assessments of 20 stocks of pelagic elasmobranchs¹⁹ and 18 stocks of small tunas²⁰ caught in Atlantic pelagic longline fisheries.

7 <https://www.st.nmfs.noaa.gov/ecosystems/climate/rap/index>

8 <http://secoora.org/fishclimateworkshop/>

9 <https://www.st.nmfs.noaa.gov/ecosystems/climate/northeast-fish-and-shellfish-climate-vulnerability/index>

10 <https://www.nefmc.org/library/amendment-8-2>

11 <http://www.mafmc.org/actions/chub-mackerel-amendment>

12 http://www.asmfc.org/uploads/file/5a70a04cCoastal_Sharks.pdf

13 <https://www.sefsc.noaa.gov/species/fish/larval/index.html>

14 <https://repository.library.noaa.gov/view/noaa/9064>

15 <https://www.st.nmfs.noaa.gov/economics/fisheries/recreational/angler-expenditures-economic-impacts/index>

16 <https://spo.nmfs.noaa.gov/sites/default/files/TM129.pdf>

17 <https://www.fisheries.noaa.gov/resource/document/2014-stock-assessment-and-fishery-evaluation-safe-report-atlantic-highly>

18 <https://www.st.nmfs.noaa.gov/humandimensions/social-indicators/map>

19 https://www.iccat.int/Documents/CVSP/CV071_2015/n_6/CV071062637.pdf

20 https://www.iccat.int/Documents/CVSP/CV073_2017/n_8/CV073082663.pdf

- ◇ SCRS set EBFM-related goals in its 2015–2020 SCRS Science Strategic Plan including: 1) to advance EBFM advice; 2) to clarify data collection needs for SCRS to provide EBFM advice; and 3) to cover research needs to include ecosystem considerations in scientific advice.²¹
- ◇ ICCAT developed a road map for developing management strategy evaluations and harvest control rules for 2015–2022.²²
- ◇ ICCAT developed interim biological reference points and a harvest control rule for North Atlantic albacore (Recommendation 17-04).²³

incorporating ecosystem information into stock management, including consideration of forage species (Action Item 5b2), and implementing the National Allocation Policy (Action Item 5c4).

In addition, we will continue to work with external partners domestically and internationally on HMS EBFM issues. One example domestically is our work with the Mid-Atlantic Fishery Management Council’s Fishery Management Action Team for Chub Mackerel (Action Item 1a5) by providing Atlantic HMS EBFM guidance and participating with council and commission ecosystem-related committees as requested. Internationally, we are working with external partners

Vision

We envision managing fisheries for Atlantic HMS in a manner that incorporates the best available information on ecosystem components, including physical, biological, economic, and social interactions, to support sustainable fisheries, as well as the communities that depend on those fisheries, so that both the fisheries and the fishing communities are healthy and resilient to threats and changing conditions.

The milestones described below will further our progress towards EBFM. Of note, the HMS Management Division is undertaking

Amendment 12 to the Consolidated Atlantic HMS FMP, which considers updating the FMP objectives to include National Standard 1 (NS1) guidance on



focusing on both management and science through continued participation in the ICCAT SCRS Sub-Committee on Ecosystems to undertake tasks such as developing mechanisms that can be used to better integrate ecosystem considerations into scientific advice provided by SCRS (Action Item 3b1).

These key milestones illustrate our commitment to implementing the EBFM Road Map for HMS.

21 <https://www.iccat.int/en/StrategicPlan.html>

22 https://www.iccat.int/Documents/Meetings/Docs/2018/REPORTS/2018_SCRS_REP_ENG.pdf

23 https://www.iccat.int/Documents/Comply/RECS_2017_ENG.PDF

Key Partners

In addition to working with staff throughout NOAA Fisheries (in the offices of Sustainable Fisheries, Habitat Conservation, Protected Resources, Science and Technology, and International Affairs and Seafood Inspection and the Greater Atlantic and Southeast Regional Offices) on issues related to EBFM, the Atlantic HMS Management Division, SEFSC, and NEFSC staff working on Atlantic HMS also work with key partners and stakeholders, including:

- Atlantic HMS Advisory Panel.
- Advisory Panel for Atlantic HMS SEDAR Workshops (aka, the SEDAR Pool).
- ICCAT Advisory Committee.
- ICCAT and SCRS.
- New England, Mid-Atlantic, South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils.
- Atlantic States Marine Fisheries Commission and Gulf States Marine Fisheries Commission
- States and territories.
- Stakeholders in Atlantic HMS fishing communities, including commercial and recreational fishermen.
- Academics researching Atlantic HMS, including researchers who hold permits under the HMS exempted fishing permits program.
- Environmental nongovernmental organizations working on Atlantic HMS issues.

Expected Outcomes and Benefits

Overall, EBFM should provide the following benefits:²⁴

- Facilitate decision-making for necessary trade-offs between different stakeholder priorities, balancing social and ecological needs.
- Provide more information to make management decisions, which should improve our ability to sustainably manage fisheries.
- Contribute to an increased ability to predict likely outcomes of management actions.
- Provide more stability of ecosystem-level measures and translate that into better regulatory stability and business plans.
- Maintain ecosystems in a healthy, productive, and resilient condition so they can provide services to humans and recover from natural or manmade disasters and other changing conditions.

We expect Atlantic HMS fisheries and fishing communities to realize the benefits of EBFM for sustainable and resilient fisheries and ecosystems and for stable and predictable management.

We expect implementation of the EBFM actions highlighted in this plan to advance NOAA Fisheries' and the Atlantic HMS Management Division's work on many ongoing initiatives that contribute to EBFM.

We also expect to bring a greater understanding of the benefits and components of EBFM for Atlantic HMS to our stakeholders and partners through engagement, and in turn to learn more from our stakeholders and partners on how we can advance EBFM.

We expect the work by ICCAT and SCRS, together with NOAA Fisheries staff, to further EBFM at an international level, which will also inform domestic management.

We expect to lay clear groundwork over the next five years for future progress on EBFM and for monitoring and maintenance of resilient ecosystems.

24 <https://www.st.nmfs.noaa.gov/ecosystems/ebfm/about>



Implementation of EBFM Road Map

Action Items

The action items in this section are presented as they appear in the EBFM Road Map. Please note that some action items were not included in this implementation plan, as described under the Rationale for Action Items Selected sections.

Guiding Principle 1: Implement Ecosystem-Level Planning

1a. Develop engagement strategies to facilitate the participation of partners and stakeholders in the EBFM process.

Road Map Action Item 1a2: Develop National and Regional EBFM engagement strategies.

Timing: Short.

Associated milestone:

- ✓ See Engagement Strategy section on pg. 27.

Road Map Action Item 1a3: Develop best practices where there are overlapping jurisdictions.

Timing: Mid.

Associated milestones:

- ✓ Identify mechanisms to work with council and commission ecosystem-related working groups to determine best practices on how to integrate Atlantic HMS EBFM actions into council and commission EBFM-related plans, as well as invite those working group members to engage on Atlantic HMS best practices.
- ✓ Continue engagement with ICCAT and the SCRS Sub-Committee on Ecosystems in developing best practices for international EBFM efforts for ICCAT and for a dialogue across tuna regional fishery management organizations.
- ✓ Continue work with key partners and stakeholders on cross-jurisdictional issues related to EBFM, such as forage species and monitoring and data collection for Atlantic HMS.



Road Map Action Item 1a4: Develop Standardized EBFM Policy and Road Map Materials for widespread use (e.g. NOAA Fisheries personnel, Sea Grant extension agents).

Timing: Short.

Associated milestone:

- ✓ Work with the NOAA Fisheries EBFM Working Group to make sure that Atlantic HMS EBFM information is included in relevant EBFM Road Map outreach materials.

Road Map Action Item 1a5: NOAA Fisheries supports any Ecosystem Plan Development Teams, Ecosystem Committees (or equivalent groups) that Councils establish.

Timing: Continuing.

Associated milestones:

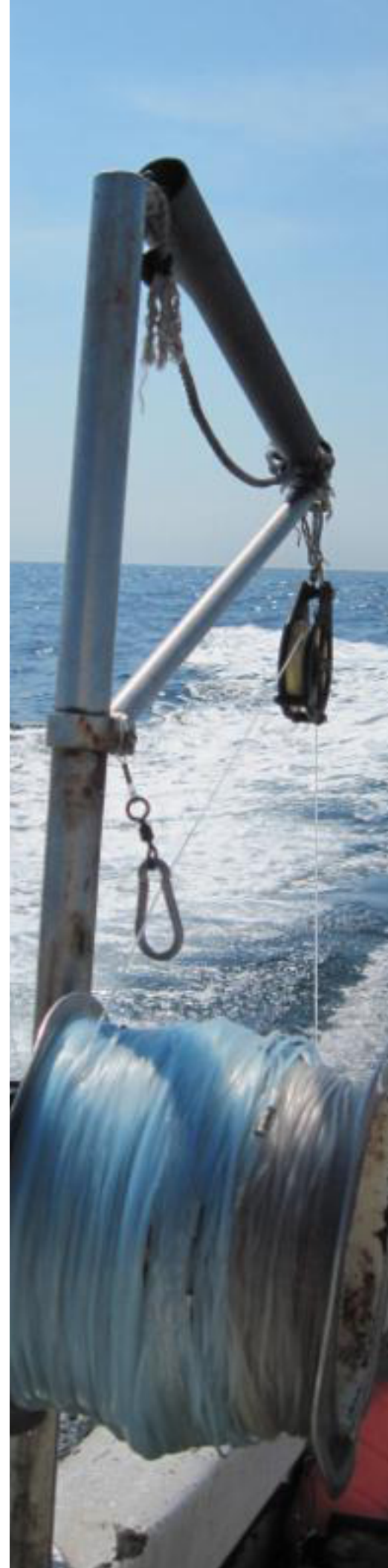
- ✓ Continue participation in ICCAT SCRS Sub-Committee on Ecosystems meetings, as well as annual ICCAT and SCRS intersessional meetings.
- ✓ Provide Atlantic HMS EBFM guidance and participate with Council and Commission ecosystem-related committees as requested, such as the Mid-Atlantic Fishery Management Council's Fishery Management Action Team for Chub Mackerel.

Road Map Action Item 1a6: Continue to explore tradeoffs in the context of EBFM issues and relevant statutory mandates.

Timing: Mid.

Associated milestones:

- ✓ Coordinate between Atlantic HMS Management Division, SEFSC, and NEFSC staff and other agency regulatory staff to identify and explore trade-offs within and between activities and components in the associated ecosystems as such activities develop (e.g., modeling, management strategy evaluation). See Guiding Principle 4.
- ✓ Identify actions that overlap between the Climate Science Strategy and the EBFM Road Map, recognizing that ecosystem actions under this plan also include climate.



1b. Support development of Fishery Ecosystem Plans [FEPs].



Road Map Action Item 1b1: Establish FEP Coordinator/Analyst for each NOAA Fisheries Regional Office and in appropriate Headquarters Office.

Timing: Mid.

Associated milestone:

- ✓ Designate an Atlantic HMS Management Division FEP Coordinator who would work with relevant management bodies to incorporate Atlantic HMS information into FEPs as appropriate.

Road Map Action Item 1b3: Assist Councils, Commissions, regional RFMOs [regional fishery management organizations], and other bodies as requested, in their development of new, or revision of existing FEPs.

Timing: Continuing.

Associated milestones:

- ✓ Explore mechanisms to coordinate with the five regional fishery management councils with jurisdictions that overlap with the range of Atlantic HMS to incorporate species information into their FEPs.
- ✓ Assist as requested in development as interstate marine fisheries commissions, ICCAT, or other bodies scope the possibility of developing FEPs.

Rationale for Action Items Selected under Guiding Principle 1

The action items selected under Guiding Principle 1 are those that the Atlantic HMS Management Division was currently working on strategies to address, that are currently in our purview to pursue, or that we see opportunities for engagement on with councils, commissions, RFMOs, and other bodies.

The action items that were not selected either had already been addressed (i.e., establishing EBFM points of contact) or would be completed on a national level (i.e., creating a prize competition for communicating EBFM and developing an inventory of existing FEPs and ecosystem considerations in FMPs); therefore, engagement by the Atlantic HMS Management Division, or SEFSC or NEFSC staff working on Atlantic HMS, is not necessary at this time.

Guiding Principle 2: Advance Our Understanding of Ecosystem Processes

2a. Conduct Science to Understand Ecosystems.

Road Map Action Item 2a1: Advance resources to conduct EBFM.

Timing: Continuing.

Associated milestone:

- ✓ Identify HMS science priorities to inform SEFSC and NEFSC research priorities that would advance EBFM technologies for, and knowledge of, Atlantic HMS if and when the opportunity arises (e.g., training in management strategy evaluations and increased participation in SCRS intersessional meetings). This includes increasing knowledge of the biology, removals, and relative abundance of data-poor species (e.g., certain shark species) to complete stock assessments as a building block for understanding species interactions.

Road Map Action Item 2a2: Develop capacity for NOAA Fisheries to conduct end-to-end ecosystem studies.

Timing: Mid.

Associated milestones:

- ✓ Continue to discuss methods to advance Atlantic HMS ecosystem research with federal, state, academic, non-governmental, and international partners.
- ✓ Provide progress reports on actions related to EBFM for Atlantic HMS under NOAA Fisheries regional climate RAPs that contribute to developing further capacity in studying ecosystems.

Road Map Action Item 2a3: Conduct a biennial EBFM Science & Management Conference.

Timing: Mid.

Associated milestones:

- ✓ Attend biennial EBFM Science & Management Conference as scheduled.
- ✓ Encourage regular communication with partners outside of conferences.



Road Map Action Item 2a4: Develop and maintain core data and information streams.

Timing: Continuing.

Associated milestones:

- ✓ Continue engagement between the Atlantic HMS Management Division, SEFSC, and NEFSC staff to include Atlantic HMS in current and future EBFM research.
- ✓ Consider trophic interactions and other ecosystem topics to be included in Atlantic HMS research needs and priorities.
- ✓ Continue to update Atlantic HMS data and information through annual publication of the Atlantic HMS SAFE Report, which includes information regarding HMS ecosystems.
- ✓ Participate in SCRS work on improving catch data on non-targeted species.
- ✓ Participate in SCRS work on considering the potential of current data sets and scientific products to be used to develop ecosystem indicators.

Road Map Action Item 2a5: A national review of the data collection programs across a wide range of disciplines, including but beyond the typical abundance and basic biological data.

Timing: Mid.

Associated milestone:

- ✓ Work with SEFSC and NEFSC staff to provide data regarding Atlantic HMS species for a national review of data collection programs once initiated and as requested.

2b. Provide Ecosystem Status Reports for each Large Marine Ecosystem.

Road Map Action Item 2b2: Establish routine, regular and dynamic reporting of ESRs [ecosystem status reports] for each LME.

Timing: Mid.

Associated milestones:

- ✓ Work with NOAA's Integrated Ecosystem Assessment Program to explore incorporating Atlantic HMS into ecosystem status reports.
- ✓ Consider including resulting ecosystem status information in the Atlantic HMS SAFE Report.
- ✓ Participate in SCRS work to develop an ecosystem report card for ICCAT, supported by products such as an ecosystem synthesis report, integrated ecosystem assessment, and ecosystem plan.²⁵

²⁵ https://www.iccat.int/Documents/Meetings/Docs/2018/REPORTS/2018_SC_ECO_REP_ENG.pdf

Rationale for Action Items Selected under Guiding Principle 2

Action items selected under Guiding Principle 2 are those that the Atlantic HMS Management Division, or SEFSC or NEFSC staff working on Atlantic HMS, has already implemented, is in the process of developing, believes should be considered to advance our understanding of EBFM processes for Atlantic HMS, or seeks engagement on with federal, state, academic, non-governmental, and international partners to improve Atlantic HMS ecosystem research.

The action item that was not selected (i.e., a national review of existing ecosystem status reports) would be completed on a national level.



Guiding Principle 3: Prioritize Vulnerabilities and Risk to Ecosystems and Their Components

3a. Identify ecosystem-level, cumulative risk (across LMRs, habitats, ecosystem functions, and associated fisheries communities) and vulnerability to human and natural pressures.

Road Map Action Item 3a1: Conduct Systematic Risk Assessments for relevant NOAA regional ecosystems.

Timing: Long.

Associated milestones:

- ✓ Implement actions related to Atlantic HMS in the Northeast Climate Science RAP through coordination with NEFSC and councils, as appropriate, on the development and evaluation of climate information for living marine resources management and participation in action teams relevant to EBFM issues (e.g., MAFMC forage fish team).
- ✓ Implement actions related to Atlantic HMS in the Gulf of Mexico Climate Science RAP (e.g., climate vulnerability assessments for Gulf of Mexico species and updates of the Gulf of Mexico Ecosystem Status Report) through participation in a regional NOAA climate team when established by SEFSC.
- ✓ Participate in the development of actions related to Atlantic HMS in the final South Atlantic Climate Science RAP and participate in a regional NOAA climate team when established by SEFSC to implement relevant actions.
- ✓ Participate in development of actions related to Atlantic HMS in the draft and final Caribbean Climate Science RAP, once initiated, and participate in regional NOAA climate team if established to implement relevant actions.
- ✓ Collaborate with SEFSC and NEFSC staff when an Atlantic HMS climate vulnerability assessment is initiated.

3b. Identify the individual and cumulative pressures that pose the most risk to vulnerable resources and dependent communities.

Road Map Action Item 3b1: Ensure that factors which impact 800+ US managed species are being considered.

Timing: Continuing.

Associated milestones:

- ✓ Consider information products resulting from actions under climate RAPs (see 3a above) as they become available to ensure that factors associated with a changing environment are considered in management of Atlantic HMS fisheries, including climate vulnerability assessments.
- ✓ Initiate the next Atlantic HMS EFH five-year review of all recently available information (from 2015 onwards) for managed species, considering non-fishing factors that impact EFH, among other



considerations, and update EFH boundaries if necessary.

- ✓ Assist NOAA Fisheries Office of Habitat Conservation staff upon request with habitat consultations on actions that may have adverse effects on Atlantic HMS EFH in state and federal waters.
- ✓ Continue participation in the ICCAT SCRS Sub-Committee on Ecosystems to undertake tasks such as developing mechanisms that can be used to better integrate ecosystem considerations into scientific advice provided by SCRS.²⁶
- ✓ Collaborate in SCRS initiatives such as the application of management strategy evaluations to Atlantic HMS stocks to evaluate biological data needs and conducting stock assessments with data-poor assessment methods for pelagic sharks, following on ecological risk assessments.²⁷
- ✓ Continue progress on stock assessment prioritization²⁸ for domestic shark stocks.
- ✓ Consider updated information in the South Atlantic and Caribbean fishery ecosystem plans when completed by SEFSC and Southeast Regional Office staff.

Road Map Action Item 3b2: Conduct Habitat Assessment Prioritization for all NOAA Fisheries regions.

Timing: Mid.

Associated milestone:

- ✓ Collaborate in finalization of habitat assessment prioritization²⁹ for Atlantic HMS in the SEFSC's habitat assessment prioritization for the southeast region.

Road Map Action Item 3b3: Conduct Fishing Community vulnerability assessments for all NOAA Fisheries regions.

Timing: Short.

Associated milestones:

- ✓ Contribute Atlantic HMS information to community vulnerability analyses being worked on by NEFSC, SEFSC, and the Office of Science and Technology as appropriate.
- ✓ Continue socioeconomic data collection and analyses of the socioeconomic impacts of regulations on Atlantic HMS fishing communities and fishery participant demographics through:
 - An annual cost earnings survey for the pelagic longline, bottom

26 https://www.iccat.int/Documents/SCRS/TofR%20SC_ECO_ENG.pdf

27 https://www.iccat.int/Documents/Meetings/Docs/2017_SCRS_REP_ENG.pdf

28 <https://www.st.nmfs.noaa.gov/stock-assessment/stock-assessment-prioritization>

29 <https://www.st.nmfs.noaa.gov/ecosystems/habitat/prioritization/index>

longline, handline, greenstick, and other commercial Atlantic HMS fisheries.

- An analysis and reporting of the results of the Atlantic HMS Tournament Economic Survey that was conducted in 2016.
 - A cost earnings study for Atlantic HMS General category fisheries started in 2018.
 - Periodic updates on angler expenditures.
- ✓ Partner on and contribute to socioeconomic actions related to Atlantic HMS fisheries in the Gulf of Mexico and South Atlantic climate RAPs (e.g., by helping to identify social and economic indicators to identify thresholds that will provide the basis for early warnings about impacts on the fishing industry and fishing communities).



Rationale For Action Items Selected under Guiding Principle 3

The action items selected under Guiding Principle 3 build on ongoing activities, including prioritization efforts and risk and vulnerability analyses, being completed by the Atlantic HMS Management Division, SEFSC, NEFSC, and SCRS with support from NOAA Fisheries staff.

The action items not selected (i.e., exploring protocols for conducting regional habitat risk assessments and ensuring integrated, systematic risk assessments) would likely be initiated at the national level, and the Atlantic HMS Management Division and SEFSC and NEFSC staff working on Atlantic HMS may seek opportunities to participate as appropriate.

Guiding Principle 4: Explore and Address Trade-Offs Within an Ecosystem

4a. Analyze trade-offs for optimizing benefits from all fisheries within each ecosystem or jurisdiction, taking into account ecosystem-specific policy goals and objectives, cognizant that ecosystems are composed of interconnected components.

Road Map Action Item 4a1: Assess and bolster ecosystem and LMR [living marine resource] modeling needs in each FSC [fishery science center].

Timing: Mid.

Associated milestone:

- ✓ Assess the inclusion of Atlantic HMS in the enhancement of trade-off modeling capacity in the SEFSC and NEFSC as it is developed, in conjunction with an evaluation of available resources to meet stock assessment demands and gaps under the Stock Assessment Improvement Plan.³⁰

Road map action item 4a3: Encourage and expand the use of multi-model inference.

Timing: Continuing.

Associated milestones:

- ✓ Consider the use of multiple alternative models and subsequent model averaging or combining in Atlantic HMS stock assessments based on the Stock Assessment Improvement Plan.
- ✓ Explore building on the use of multiple assessment models and averaging or combining model results, as used in the 2017 shortfin mako assessment, in ICCAT stock assessments.

Road Map Action Item 4a4: Establish suitable review venues and deliberative bodies for ecosystem models and associated information in each FSC region.

Timing: Mid.

Associated milestone:

- ✓ Engage in the review of stock assessment models used by SEFSC and NEFSC and in SCRS for use in the management of Atlantic HMS fisheries.

³⁰ <https://spo.nmfs.noaa.gov/content/tech-memo/SAIP2018>

4b. Develop Management Strategy Evaluation capabilities to better conduct ecosystem-level analyses to provide ecosystem-wide management advice.



Road Map Action Item 4b1: Develop functional system-level MSEs [management strategy evaluations].

Timing: Mid.

Associated milestones:

- ✓ Explore the development of MSEs to improve the management of domestic Atlantic HMS shark species.
- ✓ Continue participation in ICCAT's development of MSEs. These efforts include:
 - Refining the North Atlantic albacore MSE with the goal of adopting a long-term management procedure in 2020.
 - Developing conceptual management objectives and initiating testing of candidate management procedures for western Atlantic bluefin tuna in 2018 and developing operational management objectives, refining the MSE for western Atlantic bluefin tuna, and testing candidate management procedures in 2019, with the goal of adopting an interim management procedure in 2020.
 - Developing a multispecies MSE framework for tropical tunas, with the goal of adopting an interim management procedure in 2022.
 - Developing operational management objectives and performance indicators for North Atlantic swordfish, with the goal of adopting an interim management procedure in 2021.
 - Updating the five-year road map for development of MSE and harvest control rules (HCRs) in 2018.

Road Map Action Item 4b2: Explore novel Harvest Control Rules (HCRs) and develop associated guidelines, as appropriate and consistent with National Standards, especially to test and explore robust Ecosystem Level strategies.

Timing: Long.

Associated milestones:

- ✓ Continue working at ICCAT to develop and adopt HCRs for internationally managed species, including:
 - Participating in the continued refinement of the HCR for North Atlantic albacore.
 - Participating in the identification of candidate HCRs for western Atlantic bluefin tuna.
 - Participating in dialogue on the development of HCRs for Atlantic swordfish.
- ✓ Provide HMS data to regions and science centers exploring ecosystem-level strategies.
- ✓ Explore development of HCRs for domestically managed sharks.

Rationale for Action Items Selected under Guiding Principle 4

The above action items were selected because they are areas where Atlantic HMS Management Division, SEFSC, or NEFSC staff already have related initiatives or see a need for Atlantic HMS fisheries managers and scientists to be closely involved in action items. Part of our expected efforts involve advocating for the continued use and adoption of aspects of EBFM at the ICCAT level. Additionally, because the range of Atlantic HMS spans international and regional boundaries, some of the milestones relate to sharing data and ensuring Atlantic HMS managers are involved in the work of all relevant regions.

The action item that was not selected (i.e., creating a prize competition for communicating model and MSE outputs) is best facilitated at the national level.



Guiding Principle 5: Incorporate Ecosystem Considerations into Management Advice

5a. Develop and monitor ecosystem-level reference points.

Road Map Action Item 5a1: Delineate, evaluate, and explore best practices for estimating and using system-wide or aggregate group harvest limits, ecosystem production measures, and other ELRPs [ecosystem level reference points] to inform management decisions.

Timing: Mid.

Associated milestones:

- ✓ Continue to participate in Magnuson-Stevens Fishery Conservation and Management Act implementation of new NS1 Guidelines, including developing guidance for use of aggregate maximum sustainable yield and incorporating other ecosystem-level reference points in FMPs.
- ✓ Continue to support United States participation in the ICCAT Subcommittee on Ecosystems and the development and implementation of the ecosystem report card.³¹
- ✓ Review the ICCAT ecosystem report card when produced and identify potential actions relevant to the Consolidated Atlantic HMS FMP.

³¹ https://www.iccat.int/Documents/Meetings/Docs/2018/REPORTS/2018_SC_ECO_REP_ENG.pdf

Road Map Action Item 5a2: Explore best measures of cross-pressure, cumulative impacts in an ecosystem (in conjunction with Guiding Principle 3).

Timing: Short–mid.

Associated milestone:

- ✓ As the information becomes available through work under Guiding Principle 3, address high priority vulnerabilities and risks in planned FMP amendments/regulatory actions (e.g., ongoing and future FMP amendments, pelagic longline Individual Bluefin Quota Program regulatory amendment, and Caribbean swordfish regulatory amendment) or in the cumulative impacts sections of National Environmental Policy Act analyses or consider adding a new EBFM section to the Consolidated Atlantic HMS FMP amendment outlines.

5b. Incorporate ecosystem considerations into appropriate LMR assessments, control rules, and management decisions.

Road Map Action Item 5b2: Support consistent and effective implementation of the National Standard 1 Guidelines, which includes guidance on incorporating ecosystem information into stock management.

Timing: Mid.

Associated milestone:

- ✓ Consider updating Consolidated Atlantic HMS FMP objectives through Amendment 12 to include NS1 guidance on incorporating ecosystem information into stock management, including consideration of forage species.

Road Map Action Item 5b3: Identify best practices for incorporating ecosystem considerations into management decisions.

Timing: Short–mid.

Associated milestones:

- ✓ Incorporate relevant best practices from the updated Stock Assessment Improvement Plan³² in Atlantic HMS stock assessments.
- ✓ Consider options for including best practices for incorporating ecosystem considerations into Atlantic HMS management decisions, such as five-year EFH reviews or collaborating with regions/councils to update regional activities (e.g., South Atlantic Fishery Ecosystem Plan and ecosystem status report for Northeast Large Marine Ecosystem).
- ✓ Continue to participate in climate action planning and identify analogous processes that would be effective for incorporating EBFM

32 <https://spo.nmfs.noaa.gov/content/tech-memo/SAIP2018>

into Atlantic HMS management decisions, as described under Guiding Principle 3.

- ✓ Participate in discussions of management strategy evaluations and development of an ICCAT Ecosystem Report Card, among other EBFM-related topics, at the ICCAT Standing Working Group on Dialogue between Fisheries Scientists and Managers.

Road Map Action Item 5b4: Establish ecosystem-related TOR [terms of reference] for stock assessments (SAs), stock assessment reviews, and support ecosystem-related TOR for status review groups, HCRs, and science and statistical committee (SSC) review processes.

Timing: Mid.

Associated milestone:

- ✓ Continue ongoing coordination with NOAA, ICCAT, Atlantic States Marine Fisheries Commission, and council stock assessment processes for Atlantic HMS, and encourage development of ecosystem-related terms of reference as feasible.

5c. Provide integrated advice for other management considerations, particularly applied across multiple species within an ecosystem.

Road Map Action Item 5c1: Explore protocols for considering ecosystem-level information in EFH reviews, identifying ecosystem-level habitat areas of particular concern, and setting habitat conservation objectives and/or indicators.

Timing: Short.

Associated milestones:

- ✓ Consider results of the Habitat Assessment Improvement Plan and other possible protocols for EFH reviews in the next Atlantic HMS EFH five-year review.
- ✓ Continue to coordinate with the Office of Habitat Conservation and regional habitat conservation divisions on EFH consultations.
- ✓ Encourage consideration of a habitat goal and related indicators in the ICCAT ecosystem report card.

Road Map Action Item 5c2: Finalize and implement National Bycatch Reduction Strategy.

Timing: Short.

Associated milestone:

- ✓ Continue to participate in the development of the National Bycatch Reduction Strategy and in regional planning and implementation as appropriate.

Road Map Action Item 5c3: Evaluate the ecosystem effects of offshore aquaculture.

Timing: Long.

Associated milestone:

- ✓ Explore including the evaluation of offshore aquaculture as a non-fishing impact on EFH in amendments to the Consolidated Atlantic HMS FMP. Include ecosystem effects as available.

Road Map Action Item 5c4: Implement the National Allocation Policy.

Timing: Short.

Associated milestone:

- ✓ Implement the National Allocation Policy in Amendment 12 to the Consolidated Atlantic HMS FMP.

Road Map Action Item 5c5: Review long-term protected species recovery and rebuilding plans to ensure they account for the potential effects of near-term and long-term climate change, particularly relating to alterations to food web structure.

Timing: Long.

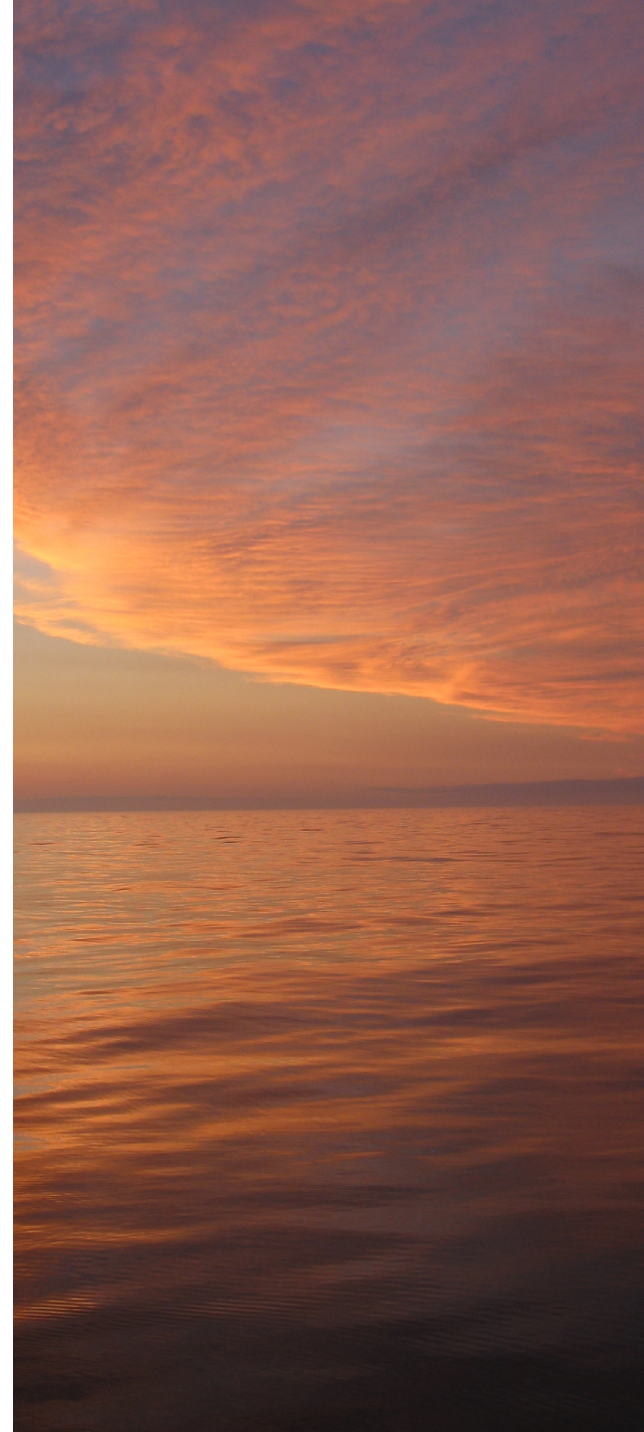
Associated milestone:

- ✓ Coordinate with the Office of Protected Resources and regional protected resources divisions to participate in the update of recovery and rebuilding plans for Atlantic HMS (e.g., scalloped hammerhead and oceanic whitetip sharks).

Rationale for Action Items Selected under Guiding Principle 5

Many of the action items identified under Guiding Principle 5 were selected because they will be included in Atlantic HMS Management Division regulatory actions anticipated to occur during the next five years. For example, an Atlantic HMS FMP amendment is tentatively slated to address changing FMP objectives, the standardized bycatch reduction methodology, and allocation criteria. Other amendments and regulatory actions, such as the next Atlantic HMS EFH five-year review, may be appropriate for incorporating EBFM information and protocols as they become available from the Office of Science and Technology and other NOAA teams and/or offices.

The action item that was not selected (i.e., tracking fishery stock status indices that use ecosystem considerations) is best facilitated at the national level. The Office of Science and Technology currently tracks fishery stock status indices at a national level using the Species Information System.



Guiding Principle 6: Maintain Resilient Ecosystems

6a. Evaluate ecosystem-level measures of resilience.

Road Map Action Item 6a2: Evaluate, conduct and track ecosystem goods and services valuation methods and best practices.

Timing: Mid.

Associated milestone:

- ✓ Coordinate with the Office of Science and Technology as they develop national-level methods and best practices to evaluate, conduct, and track ecosystem goods and services.

6b. Evaluate community well-being.

Road Map Action Item 6b1: Explore community health and well-being socioeconomic metrics.

Timing: Mid.

Associated milestones:

- ✓ Encourage consideration of a socioeconomic goal and related indicators to evaluate in the ICCAT ecosystem report card.
- ✓ Use the annual cost earnings survey for the pelagic longline, bottom longline, handline, greenstick, and other commercial Atlantic HMS fisheries as well as a new pilot General category cost earnings survey to better understand community health and well-being and determine if these surveys could be used for developing well-being socioeconomic metrics.
- ✓ Explore how to include metrics and data collection tools to track additional measures of community well-being, including socioeconomic metrics.
- ✓ Continue to monitor community health in the annual Atlantic HMS SAFE Report.
- ✓ Coordinate with the Southeast For-Hire Integrated Electronic Reporting team and draw from economic aspects of reporting, if implemented, for community health tracking.
- ✓ Use the community profile series developed by the Office of Science and Technology to monitor community health and well-being indicators.
- ✓ Review and contribute to efforts evaluating the existence and magnitude of subsistence fishing in the Caribbean region as appropriate.



Road Map Action Item 6b2: Adopt community vulnerability analyses to a broader range of cumulative factors.

Timing: Mid.

Associated milestone:

- ✓ Contribute to the community vulnerability analysis that is being developed by NEFSC, SEFSC, and the Office of Science and Technology as appropriate.

Road Map Action Item 6b3: Track community health, well-being and vulnerability socio-economic metrics.

Timing: Mid–continuing.

Associated milestone:

- ✓ Continue to monitor community health using methods described under Guiding Principles 6b and 3b, “Conduct Fishing Community vulnerability assessments for all NOAA Fisheries regions.”

Rationale for Action Items Selected under Guiding Principle 6

The action items selected are strategies that are currently being worked on or can be developed in the near- to mid-term to address the associated guiding principle. The action items not selected (i.e., to evaluate ecosystem-level reference points, develop best practices for trade-off evaluation for overall ecosystem and community resilience and well-being, and develop national EBFM performance measures) would be carried out at a national level or in the long-term. The HMS Management Division and SEFSC and NEFSC staff working on HMS could engage as requested with any national work groups formed during development of these actions.

Engagement Strategy

The Atlantic HMS EBFM engagement strategy will leverage meetings that the Atlantic HMS Management Division and SEFSC and NEFSC staff working on HMS either host or attend, with key partners and stakeholders, to provide updates on HMS EBFM activities and be supportive of partner EBFM actions. The Atlantic HMS Management Division will also reach out to regional fishery management councils and interstate marine fisheries commissions to increase the level of communication regarding EBFM issues, as well as use the NOAA Fisheries website and the Atlantic HMS email listserv to communicate EBFM information to fishery stakeholders and the public. In addition, there may be opportunities to

participate in the meetings of scientific societies (e.g., American Fisheries Society, American Elasmobranch Society, American Society of Ichthyologists and Herpetologists) and associated symposiums or workshops to share and learn about new work on ecosystem studies relevant to Atlantic HMS. Finally, the Atlantic HMS Management Division will work to collaborate with domestic and international partners on cross-jurisdictional issues, as well as on data collection and monitoring, related to EBFM implementation.

Action	Milestone(s)	Key Partners and Stakeholders
Provide updates to and solicit feedback from partners and stakeholders on HMS EBFM-related activities.	<ul style="list-style-type: none"> • Solicit feedback and provide information on draft and final versions of the Atlantic HMS EBFM Implementation Plan. • Discuss progress on plan development and implementation at Atlantic HMS Advisory Panel meetings biannually or as needed. • Attend council and commission meetings as requested to participate in EBFM-related activities. • Work with key partners and stakeholders on cross-jurisdictional EBFM issues. • Collaborate with states, territories, and other relevant partners on ecosystem research and data collection (e.g., monitoring and data collection to support stock assessments). • Incorporate Atlantic HMS EBFM information in materials developed by the NOAA Fisheries National EBFM Outreach Working Group. • Disseminate Atlantic HMS EBFM information on HMS website and email listserv. 	<ul style="list-style-type: none"> • Regional fishery management councils. • Interstate marine fisheries commissions. • States and territories. • Commercial and recreational fishing interests. • Academic and environmental stakeholders. • General public.
Engage with EBFM-related activities undertaken through ICCAT.	<ul style="list-style-type: none"> • Participate in discussions at ICCAT meetings (i.e., annual meeting, intersessional meetings, working groups, and Advisory Committee meetings) annually or as needed. 	<ul style="list-style-type: none"> • ICCAT member country representatives, scientists, and managers. • NOAA staff and other members of the U.S. delegation. • ICCAT Advisory Committee.
Coordinate with EBFM efforts of relevant councils and commissions.	<ul style="list-style-type: none"> • Have Atlantic HMS EBFM point of contact engage as needed with council and commission staff on EBFM activities to determine where coordination is appropriate. 	<ul style="list-style-type: none"> • Regional fishery management councils. • Marine fisheries commissions.
Coordinate with EBFM efforts in other NOAA Fisheries offices and regions.	<ul style="list-style-type: none"> • Have Atlantic HMS EBFM point of contact engage with larger NOAA Fisheries EBFM Working Group, as scheduled. • Continue coordination between the Atlantic HMS Management Division and NOAA Fisheries science centers as appropriate on how to incorporate Atlantic HMS EBFM into fisheries research and priority areas for Atlantic HMS EBFM research. • Engage as needed with regional staff to determine where coordination on EBFM activities is appropriate. • Participate in biennial EBFM Science & Management Conference as scheduled. 	<ul style="list-style-type: none"> • NOAA Fisheries staff.