



# Atlantic States Marine Fisheries Commission

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## MEMORANDUM

April 22, 2015

To: Atlantic Menhaden Management Board  
From: Atlantic Menhaden Advisory Panel  
RE: Advisory Panel Recommendations on Setting Fishery Specifications

The Advisory Panel met via conference call on April 10, 2015 to review the results of the 2015 benchmark stock assessment and peer review as well as formulate recommendations for the fishery specifications setting process. Panel members in attendance represented the commercial harvesters (for bait and reduction) and bait dealers. The following is a summary of the conference call.

### Attendees

#### *Advisory Panel Members*

Ron Lukens (VA)	<i>ASMFC Staff</i>	Marty NJ Commercial Fishermen
Jimmy Kellum (VA)	Mike Waine	Steve Meyers
Jeff Kaelin (NJ)		Bunker Bill
Jennie Bichrest (ME)	<i>Public</i>	Ritchie Iverson
Melissa Dearborn (NY)	Aaron Kornbluth	Bill Foreman
John Dean (MD)	Shaun Gehan	Thom

### 2015 Atlantic Menhaden Benchmark Assessment

AP members reviewed results of the 2015 Atlantic menhaden benchmark stock assessment and the independent peer review. They applauded the stock assessment subcommittee for its hard work in completing a stock assessment that is more comprehensive and passed favorably with the peer review. Generally, the AP commented that the results of the assessment match what they are seeing on the water.

An AP member asked what reference points are used to manage other small pelagic fisheries around the world and stated that it appears that the single species reference points, as recommended by the peer review, appear very conservative. Additionally, it was mentioned that stock (recruitment) conditions seem to be driven by environmental conditions as indicated on the fecundity plots so there was concern expressed that managing to the reference points may not yield the expected results. If, however, environmental conditions are right, the menhaden spawning stock biomass should aid in recruitment.

It was also discussed by the AP that the new, peer reviewed reference points of  $F_{26\%MSP}$  (threshold) and  $F_{57\%MSP}$  (target) already equate to “Ecosystem Reference Points” since projections are conservative and should ensure that adequate forage remains in the water, as estimated by the new assessment, through two natural mortality estimates that produce “age-

varying, time constant values; scaled to estimates from the tagging data”. (See 2015 Benchmark Stock Assessment)

Some AP members stated that the implementation of Amendment 2 and the quota is likely not the cause for the increase in the improved stock status. The change in the assessment data inputs and the models were larger drivers of change in stock status than the management.

An AP member that submitted comments indicated that although the stock is not overfished and overfishing is not occurring the role of menhaden as prey is vitally important and the abundance of younger fish is currently low from recent years of poor recruitment. Further, the need for ecosystem reference points still exists.

#### Development of Ecosystem Reference Points

AP members agree that stakeholders, managers and scientist need to agree upon the multi-species management and there was concern that the management process is not currently setup to handle that type of ecosystem approach.

An AP member referenced the Mid-Atlantic Council’s ecosystem management guidance document and commented that it suggests keeping it simple by making sure the single species approaches are robust before adding ecosystem complexity.

An AP member that submitted comments highlighted the need for an addendum to institute ERPs.

Generally, the AP concluded it is interested in being involved in the continued development of ecosystem reference points.

#### Fishery Specification Recommendations

Attending AP members were in favor of multi-year fishery specifications to avoid large swings in the TAC. The AP recommended a three year specification, so choosing a TAC that would remain in place through 2017. The AP commented that it is easier to make business plans with a stable TAC for a three year time period. The 2015 fishing year is almost underway and the industry is awaiting the fishery specifications. AP members commented that this poses significant business challenges when they don’t find out about specifications until May within the fishing year.

AP members commented that the industry would be under-fishing relative to the new single species target reference point of  $F_{target} = 0.38$ . Also, based on projection results, there is a less than a 5% chance of overfishing with all of the TAC levels that range from 170,800 to 213,500 metric tons (mt). As a result, AP members on the call recommended at least a 213,500 mt TAC, but would prefer a TAC level that maintains fishing mortality at the new  $F_{target}$ , or approaching it, which is preliminary estimated to result in a higher TAC than 213,500 mt. AP members commented that they wanted to see the projections at  $F=0.38$  and they were disappointed that the projections from the new assessment had not yet been made available to the public yet, making it

difficult for the industry to coalesce around a scientifically-derived yield from the fishery during the next three fishing years.

An AP member that submitted comments recommended keeping the existing catch limits in place and, instead of adjusting the quota, focus on long-term ecosystem goals.



## MARKING TIME

### *NEW MENHADEN STOCK ASSESSMENT HIGHLIGHTS, YET AGAIN, THE NEED FOR ECOSYSTEM GOALS*

By Ken Hinman, *President*

*We have all been here before.*  
- David Crosby, **Déjà Vu**

The just-published 2015 Atlantic menhaden stock assessment says the species is not overfished and overfishing is not occurring.<sup>i</sup> Okay, we've heard that before. But what does it mean, really?

Well, some in the menhaden industry<sup>ii</sup> would have you believe it means there are plenty of fish out there; that there's no need for catch limits now, including those put in place two years ago, and never has been. But anyone who believes that just doesn't get it. Never has, probably never will.

The concern of anglers and environmentalists about the status of menhaden has always been about its vital role as a prey species for predators up and down the east coast. So it's important to understand that this latest evaluation of the menhaden stock addresses only its ability to sustain harvest and avoid depletion<sup>iii</sup>, not its capacity to provide adequate forage for other species in the ecosystem. In this way it's no different than every other assessment performed by the Atlantic States Marine Fisheries Commission since 1999, when an expert review panel recommended future assessments use a reference point "responsive to menhaden as a forage species...which maximizes population abundance."<sup>iv</sup> Unfortunately, that change in the way we judge the status of Atlantic menhaden is still on the ASMFC's "to-do" list 15 years later.

### **Good News, Bad News**

There is some good news in the new status report, which suggests that reduced fishing pressure is having positive effects on growth in the menhaden population. The assessment reveals an increase among fish in the oldest age

classes, with more large adults than in previous estimates, an increase that coincides with lower fishing mortality rates over the past decade. We would expect this trend to continue with the conservation measures implemented in 2013.<sup>v</sup>

But the assessment also confirms that abundance of menhaden – that is, total numbers of fish - remains near historic lows. It is overall abundance that is most relevant to menhaden’s ecological role, not adult biomass, since many predators, striped bass and osprey for instance, depend on large numbers of small, juvenile menhaden. Because of poor recruitment, especially in Chesapeake Bay nursery grounds, the total numbers of menhaden actually declined since the last benchmark assessment in 2010.

### **Stay the Course and Set Ecosystem Goals Now**

The bottom line is this: Without ecosystem goals, the new menhaden single-species stock assessment leaves key questions unanswered and the industry arguing against conservation measures already on the books, measures adopted to increase menhaden abundance and availability as forage.<sup>vi</sup>

In our view, the 2015 assessment argues not for changing course, but for moving ahead more quickly with development of ecological reference points for Atlantic menhaden.

Here’s what the ASMFC Menhaden Management Board should do:

#### **1. Keep the existing catch limits in place.**

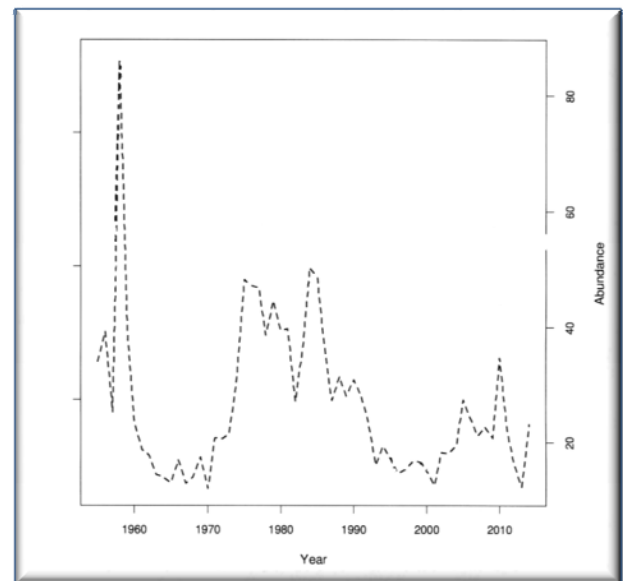
It would be folly to reverse course at the first sign of improvement, especially given lingering concerns about low abundance and recruitment. On the contrary, now is the time to hold the line and focus our full attention on long-term ecosystem goals. Making this even more imperative is the commission’s recent action to rebuild striped bass, whose health and numbers are strongly linked to availability of its preferred prey, menhaden.<sup>vii</sup>

#### **2. Begin an addendum to institute interim ERPs.**

The 2015 assessment review panel agreed with previous panels that “development of Ecological Reference Points should be a priority for

**ABUNDANCE OVER TIME FOR ATLANTIC MENHADEN FROM 1959 - 2013.**

*Source: SEDAR 40. 2015. Figure 7.2.3.4.*



Atlantic menhaden management” and agreed with the Atlantic Menhaden Technical Committee that the Menhaden Management Board needs to provide more explicit ecosystem goals and objectives in order to determine which ERPs should be adopted. The approaches for developing ERPs identified by the TC range from using highly complex and data-intensive multi-species models and empirical analyses to the use of *ad hoc* reference points based on well-known trophic principles as recommended by recent forage fish studies.<sup>viii</sup>

The TC advises that these “forage services” reference points (i.e.,  $F=0.75M$ ,  $F=M$ ,  $B_{75\%}$  and  $B_{40\%}$ )<sup>i</sup> “could be adopted at any time using the most recent peer reviewed Atlantic menhaden model”<sup>ix</sup> (emphasis added). The 2015 peer review panel, while favoring a multispecies approach to modeling the dynamics among menhaden and its predators, suggests this work could be done “in parallel to simpler approaches that may provide interim solutions until the multi-species model is ready.”<sup>x</sup> (emphasis added)

### **A Simpler, Interim Approach to Protecting the Ecological Role of Menhaden**

As the peer review panel’s report states, a broader ecosystems approach to conserving Atlantic menhaden demands recognition of the trade-offs associated with managing menhaden to serve directed fisheries vs. maintaining adequate forage to serve ecosystem needs (as well as the needs of other fisheries that target predator species). Indeed, considering both sides of the equation is paramount in making sound policy decisions. But the fact is, these trade-offs are already occurring under our current regime, and until the ASMFC adopts ecosystem goals for menhaden and begins using them to inform and guide its management decisions, we are ignoring one side of the equation - that is, the impact on predators, on other fisheries and on the ecosystem.

Even if it were possible to create an accurate mathematical model of a complex marine ecosystem for fishery management purposes, and that is highly questionable,<sup>xi</sup> the demands on fishery managers, let alone their scientific advisors tasked with creating and feeding such a model (no pun intended), would be unbearable. It would require making innumerable decisions throughout the system about desirable targets and thresholds for interconnected species, monitoring them simultaneously, assessing cause-and-effect, and taking multiple complementary actions through numerous individual fishery management plans governed by separate management bodies. It is a black hole from which we would likely never emerge.

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<sup>i</sup> Since the Lenfest report is cited as a source for these reference points, it should be pointed out that, for species considered “intermediate tier” in terms of available information and understanding (such as menhaden), the F-based reference point should be less than or equal to 0.5M or 0.5FMSY, whichever is less.

The sensible thing to do is take interim action now to adopt ecological reference points based on sound trophic principles, such as those suggested in Section 2.4.1 of Appendix E of the 2015 stock assessment report. If a more empirical method should become viable sometime in the future, make the change then. But continuing to mark time with menhaden is not an option.

## Endnotes

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<sup>i</sup> SEDAR. 2015. SEDAR 40 – Atlantic Menhaden Stock Assessment Report. SEDAR, North Charleston SC. January 2015.

<sup>ii</sup> <http://www.rrecord.com/-news/2015/1-22-15/bus2.asp>

<sup>iii</sup> SEDAR. 2015. p. 7.

<sup>iv</sup> ASMFC 1999. Stock Assessment Report No. 99-01 (Supplement) of the Atlantic States Marine Fisheries Commission. *Atlantic Menhaden Stock Assessment Report for Peer Review*. February 1999. p. X.

<sup>v</sup> <http://wildoceans.org/menhaden-numbers-are-in-and-the-news-is-good/>

<sup>vi</sup> ASMFC 2012/2013. ASMFC Approves Atlantic Menhaden Amendment 2. *Fisheries Focus*. Vol. 22, Issue 8. December 2012/January 2013.

<sup>vii</sup> See *Wild Oceans* statement to the ASMFC Striped Bass Management Board, Mystic, CT. October 29, 2014.

<sup>viii</sup> The examples of “forage services” reference points offered by the TC were first recommended to the TC and Menhaden Management Board by *Wild Oceans* in June 2009, in a paper entitled *Ecological Reference Points for Atlantic Menhaden*, and were based on a review of the literature at that time. Since then, a number of forage fish studies have affirmed a consensus around these recommendations, including Smith, Anthony D.M., et al. 2011. *Impacts of Fishing Low-Trophic Level Species on Marine Ecosystems*. *Science*. 1209395. 21 July 2011; and Pikitch, E., Boersma, P.D., Boyd, I.L., Conover, D.O., Cury, P., Essington, T., Heppell, S.S., Houde, E.D., Mangel, M., Pauly, D., Plagányi, É., Sainsbury, K., and Steneck, R.S. 2012. *Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs*. Lenfest Ocean Program. Washington, DC. 108 pp.

<sup>ix</sup> SEDAR. 2015. Appendix E. p. 30.

<sup>x</sup> SEDAR 2015. SECTION III: Review Workshop Report. p. 23.

<sup>xi</sup> Pilkey 2007. *Useless Arithmetic: Why Environmental Scientists Can’t Predict the Future*. Orrin H. Pilkey and Linda Pilkey-Jarvis. 256 pages, Columbia University Press, New York, 2007.



Mid-Atlantic Fishery Management Council  
Ecosystem Approach to Fishery Management Guidance Document  
Draft Outline (revised 5/30/14)

## **1. Introduction**

The Mid-Atlantic Fishery Management Council (Council) has been considering mechanisms to introduce ecosystem considerations into the fishery management process since the late-1990s. In the fall of 2011, the Council hosted the fourth National Scientific and Statistical Committee Workshop which was convened to provide an opportunity for the eight Council SSCs to discuss incorporation of ecosystem considerations in federal fisheries management (Seagraves and Collins 2012). After a review of the various approaches to incorporating ecosystem considerations into fishery management around the US, the MAFMC adopted the approach being taken by the Pacific Fishery Management Council's (PFMC). The PFMC Fishery Ecosystem Plan is intended to act as an "umbrella" plan to introduce ecosystem considerations in PFMC management actions in a step-wise, evolutionary fashion. While the Council has adopted the general PFMC approach, various aspects of ecosystem approaches to fishery management being taken by the other six fishery management Councils are being considered here as well.

This approach addresses several key elements necessary for the successful implementation of an ecosystem approach to fisheries management. The first is the need to carefully develop a transition strategy to move from the current single-species focused management approach to a multi-species/ecosystem one. This transitional approach will allow the Council to meet its current MSA requirements with respect to the prevention of overfishing and attainment of OY while moving towards a definition of OY which truly takes into account impacts on multiple dimensions of the environment/ecosystem, of which humans are inextricably a major component.

The second desirable aspect of this strategy is that it allows for the growth and development of EAFM policy at a rate commensurate with existing science. It is important that EAFM policy be developed in a step-wise fashion such that management policy does not exceed current or reasonably expected advances in the science necessary to support it. Another desirable attribute of the approach is the recognition that stakeholder involvement is imperative to success. It is also recognized that EAFM will likely require engagement of a much broader range of stakeholder interests compared to traditional fisheries management.

This EAFM Guidance Document is intended to provide overall guidance to the Council with respect to the incorporation of ecosystem considerations into its current management programs. Based on this guidance, initial implementation of Council management actions with respect to ecosystem considerations will occur in a consistent, coordinated fashion, but within the existing FMP structure. This guidance document was developed to allow the Council to transition to an EAFM, but it could ultimately be converted into a regulatory document in the future (i.e., a stand-alone Fishery Ecosystem Plan or FEP).

## **2. Purpose and Need**

Specific national guidance on how to implement ecosystem considerations into the federal fishery management process is currently lacking. This EAFM Guidance document is intended to

enhance the Council's species-specific management programs with more ecosystem science, broader ecosystem considerations and management policies that coordinate Council management across its Fishery Management Plans (FMPs) and the relevant ecosystems. The document provides a framework in the form of guidelines for considering policy choices and trade-offs as they affect FMP species and the broader ecosystems. Most importantly, the intent of the Council is to develop a practical "how-to" guide for the implementation of EAFM that will allow the Council to transition to an ecosystem approach to management following the guidelines established herein.

The needs for an ecosystem-based fishery guidance document within the Council process are:

1. Improve management decisions and the administrative process associated with providing biophysical and socio-economic information on ecosystem climate conditions, climate change, habitat conditions and ecosystem interactions.
2. Provide adequate buffers against the uncertainties of environmental and human-induced impacts to the marine environment by developing safeguards in fisheries management measures.
3. Develop new and inform existing fishery management measures that take into account the ecosystem effects of those measures on ecosystem species, habitat, and fishing communities.
4. Coordinate information across FMPs for decision-making within the Council process and for consultations with other regional, national, or international entities on actions affecting ecosystems or FMP species.
5. Identify and prioritize research needs and provide recommendations to address gaps in ecosystem knowledge, particularly with respect to the cumulative effects of fisheries management on marine ecosystems and fishing communities.

Perhaps the most important aspect of EAFM is that will allow the Council to make specific management decisions based on a policy that considers the impacts of incremental management measures on the ecosystem. Conversely, it will also allow the Council to evaluate

### **3. EAFM Definition**

*An ecosystem approach to fishery management recognizes the biological, economic, social, and physical interactions among the components of ecosystems and attempts to manage fisheries to achieve optimum yield taking those interactions into account*

### **4. EAFM Goal**

*To manage for ecologically sustainable utilization of living marine resources while maintaining ecosystem productivity, structure, and function.*

## 5. Ecosystem Considerations of Highest Priority for Development of EAFM Guidelines

Based on Council and SSC discussions and stakeholder input from the Councils Visioning project, the Council concluded in October 2012 that the EAFM document should focus initially on the following major issues:

1. Forage/low trophic level species considerations
2. Species interactions (predation, competition) and their effects on sustainable harvest policy
3. Incorporation of social and economic considerations in OY
4. Effects of systematic changes in oceanographic conditions on abundance and distribution of fish stocks and ramifications for existing management approaches/programs
5. Incorporation of habitat conservation and management objectives in the current management process.

## 6. EAFM Principles (under construction)

### 7. Description of the Ecosystems (under construction)

#### Delineating the ecosystem(s); geographical scale and extent

#### Biological Components and relationships

Description of trophic structure/food webs

Key predator-prey relationships

Forage species warranting special management consideration

#### Oceanographic features (physical, chemical)

Climate and Physical interactions

Habitat(s) (including human effects)

Ecosystem based EFH definitions

### 8. Description of Managed Fisheries (under construction)

#### Social and Economic

Harvest and processing sector

Fishery Dependent Communities

Fleet dynamics

Valuation methods

### 9. Description of Existing FMPs and Management Structure (under construction)

Description of current FMPs and management process (including inter-jurisdictional issues)

Cross FMP evaluation of goals and objectives

Identification of potential conflicts and solutions

- 10. Operational Handbook - Transitional Strategy to EAFM (under construction)
  - Incorporation of EAFM into existing FMPs
    - Policy guidelines addressing tradeoffs between yield and ecosystem effects
    - ABC and OY Control rules
      - Forage species considerations
      - Incorporation of climate effects
      - Incorporation of social/economic considerations
      - Species interactions and addressing competing objectives and ecosystem effects via management strategy evaluation
    - Prohibition of new fisheries for forage species
    - Habitat Considerations
      - Ecosystem based EFH and HAPC designations
      - Water quality issues
    - Consideration of system level OY caps
  - Addressing elements of Council's visioning/strategic plan
    - Integrate Ecosystem research needs in Council research plan
  - Governance Framework to address dynamic processes affecting the ecosystem(s)
    - Ecosystem regime shifts
    - Climate change (develop predictive climate velocity models)
  - EAFM in context of Marine Spatial Planning
    - Development of time variant geospatial models
    - Distribution of species and fisheries in time and space

Development Key:

Seagraves

Hare

Gaichas

Depiper

Lederhouse/Abrams

## Summary of Ecosystem Considerations for inclusion in EAFM Document

### Forage Species Issues

1. Finalize forage definition
2. Fully develop list of forage species in MA – describe past and present abundance
3. Assess current forage base in MAB; define/describe functional groups (in assessing forage base adequacy); develop policy analysis in support of potential prohibition on new forage/LTL fisheries
4. Develop options for ABC control rule protocol and risk policy modifications incorporating M2 (predation mortality)

### Ecosystem Impacts Due to Climate Change

Understanding climate change and the associated impacts on the ocean environment has emerged as one of the major challenges facing fishery science and management. The purpose of this portion of the EAFM guidance document purpose is to 1) inform the Mid-Atlantic Council about the state of climate science relative to prediction of climate change and 2) to describe the ecosystem impacts/changes which have already occurred and are likely to persist or intensify over the next two decades. The intent is to provide the Council with the current state of knowledge relative to climate change and the expected range of impacts on living marine resources under Council jurisdiction and to aid the Council in the development of an adaptive fishery management framework that can respond effectively to ecosystem responses related to climate change.

#### Key elements

Description of physical oceanography of the system (Hare)

- key features/drivers (atmospheric/oceanographic forcing)
- recent and future climate change
- improve link between climate and physical predictions

Climate vulnerability and risk assessment (Hare/Seagraves)

Which species/fisheries are at greatest risk?

#### Key areas of interest/concern

Science (biological issues)

1. Predict/monitor changes in distribution (climate change predictions/climate velocity models)
  - stock id, stock unit
2. Predict/monitor changes in productivity
  - monitor changes in growth, maturity, survival and recruitment (stock assessments);
  - include environmental covariates in current assessment models (stock assessment TOR)
  - monitor /update biological reference points (Council/SSC)
  - explore multi-species models, functional groups, more complex whole ecosystem models (Gaichas)
3. Ecosystem state changes and impacts on fishery prosecution and production (Hare/Gaichas)

Based on integration and evaluation of 1 and 2 above, can we identify future ecosystem states which might significantly alter the fundamental structure and productivity of the ecosystem as a whole? How will these changes impact fishery resources and their management?

#### 4. Description of Fleet Dynamics (Depiper)

- describe information needed to inform description/evaluation of fleet behavior and dynamics in response to change in species distributions and productivity
- What analytical models/analyses are available and/or need to be developed to describe the expected fleet behavior in response to changing oceanographic conditions and shifting species distributions and interactions

#### Management (Policy issues)

##### 1. Develop guidelines to revise current management structure and operations to accommodate shifting species distributions

- develop operational climate velocity models to predict future stock distributions under various climate change scenarios (Hare/Seagraves/[Pinsky?])
- evaluate need for more flexible, malleable management units/boundaries by species/fishery; consider alternative multi-species management clusters
- explore how allocations are expected to be impacted by shifting distributions both among established management areas and fishery sectors (Seagraves/Hare)
- identify other significant management/policy issues likely to emerge as a consequence of climate change (changing discard patterns ?) [EAFM WG]

##### 2. Evaluate Council Risk Policy relative to climate change

- explore changes to Council risk policy (ABC specification) for climate sensitive species
- i.e., be more precautionary for species which are sensitive and vulnerable but for which climate effects have not adequately incorporated in stock assessments (Council/SSC)

##### 3. Re-evaluate goals and objectives across FMPs (Seagraves)

- conduct cross-FMP evaluations of goals and objectives to incorporate ecosystem considerations, in particular in light of climate changes issues

### **Habitat Considerations**

##### 1. Demonstrate and communicate the value of habitat to managed fisheries and transition to landscape/ecosystem level habitat descriptions and conservation.

- strengthen EFH designations and consider “essential” from an ecosystem perspective emphasizing connectivity between species, life history stages, etc.
- quantitatively link habitat science and conservation to fishery outcomes (focus on ecosystem resilience and productivity)

##### 2. Determine if existing habitat authorities are being fully utilized and provide guidance to improve efficacy of implementation

##### 3. Identify research needs and actions to support Council habitat mandates and decision-making needs

- establish goals and metrics

4. Incorporate water quality into EFH considerations

### **Species and Fisheries Interactions (Gaichas/Seagraves)**

1. Develop food web for MAB and analytical framework to assess food web dynamics in the MAB, NE Shelf Ecosystems; assess current forage base in MAB and explore definition/description of functional groups for use in maintenance of adequate forage base within the ecosystem(s)
2. Develop multi-species models which take species interactions into account; develop transition strategy to couple multi-species models with ecosystem level models
3. Assess how climate forcing will affect NE Shelf ecosystems from multi-species perspective (i.e., competition, predation, etc.)
4. Describe any ecosystem regime shifts which have already occurred and/or are likely to occur over next 5-20 years
5. Describe recent and future technological interactions among fisheries

### **Social and Economic Considerations (Depiper/Seagraves)**

1. Description of fleet dynamics in Mid-Atlantic (past, present, future)
2. Develop protocol for integration of social and economic analyses into OY considerations, especially from ecosystem level perspective (i.e., integrate social/economic analyses into other ecosystem focus areas – forage management, multi-species OY, habitat, climate change)
3. Describe technological interactions among fisheries

Black Sea Bass Research Track Assessment

**Draft Work Plan (5/28/14)**

April 2014	Formally Establish Research Assessment Working Group at Spring NRCC Meeting  Membership: NEFSC, ASMFC and MAFMC Staff, MAFMC SSC, ASMFC Technical Committee, Other  Tasks: Initiate BSB Research Track Assessment TOR Development
[Summer 2014	ASMFC TC work on age compositions and indices and review Commission aging workshop results]
June 2014	Initiate Peer Review of RSA BSB Trap Survey (MAFMC/ASMFC)
July 2014	Meeting 1 – via conf call BSB RAWG (Develop TORs, NEFSC present recent simulation modeling work - Shepherd/Blaylock/Feaver)
August 2014	Peer Review of BSB Trap Survey
August/Sept 2014	BSB RAWG Progress Report to SSC/Council/ASMFC-approve TOR, BSB RAWG update, and Review BSB Survey Peer Review  Meeting 2 – BSB RAWG joint with full TC (Data Meeting, Preliminary Model Discussion) -review BSB survey Peer review -TC report on Age compositions, indices
January 2015	BSB RAWG Meeting 3 (Model development)
May/June 2015	BSB RAWG Meeting 4 (Modeling)
May 2015	BSB RAWG Progress Report to SSC/Council/ASMFC
September 2015	BSB RAWG Meeting 5 (any additional work, draft assessment report)
Dec 2015/Jan 2016	BSB RAWG Meeting 6 with full TC to finalize Assessment Report
Spring 2016	Independent Peer Review of BSB Research Track Assessment Report
July/August 2016	Incorporate BSB Research Track Results in 2017 BSB Specifications



## Black Sea Bass Research Track Assessment

### Terms of Reference

May 29 2014 Draft

1. Explore cohort tracking to verify utility of fishery independent surveys in tracking abundance and/or year class strength.
2. Examine the spatial timing and coherence of fishery-independent surveys relative to black sea bass distribution and migration.
3. Explore options for developing new age-length keys.
4. Develop new assessment model(s) that address:
  - a. ageing uncertainty
  - b. the spatial structure and migratory behavior of black sea bass
  - c. the unique life history features of black sea bass (e.g., protogynous life history, sex-specificity, etc.)
  - d. the incorporation of all available length and age data
  - e. the incorporation of time-varying catchability to account for possible density dependent catchability in fishery independent surveys.
5. Develop new biological reference points that take into account the complexities of black sea bass life history.
6. Examine impact of systematic oceanographic changes on abundance and distribution