



## New England Fishery Management Council

50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116

E.F. "Terry" Stockwell III, *Chairman* | Thomas A. Nies, *Executive Director*

## MEETING SUMMARY

### Ecosystem Based Fishery Management (EBFM) Committee

DoubleTree Hotel, 50 Ferncroft Road, Danvers, MA 01923

September 19, 2016

The EBFM Committee met on September 19, 2016 in Danvers, MA to receive and evaluate a report from the Plan Development Team (PDT) on an Operational Framework to support development of an example Fishery Ecosystem Plan (eFEP). The committee also discussed how and when the next phase of eFEP would proceed.

**MEETING ATTENDANCE:** John Pappalardo (Chairman), Dr. Matthew McKenzie (Vice Chair), Mary Beth Tooley, Dr. Michael Sissenwine, Terry Alexander, and Dr. Michael Armstrong (substituting for Dr. David Pierce); Andrew Applegate (NEFMC staff, PDT chair); William Wilcox (NMFS GARFO staff); and Mike Fogarty (NEFSC). In addition, six members of the public attended.

Presentations and background documents are available on the Council's EBFM web page (<http://www.nefmc.org/calendar/sept.-19-2016-ebfm-committee-meeting>).

#### **KEY OUTCOMES:**

After hearing reports from Andrew Applegate and Dr. Fogarty on the draft Operational Framework document, the committee provided feedback about the next steps that the PDT should pursue. To this end, the committee passed the following motions to a) support a peer review of the application of operating models to the Georges Bank Ecosystem Production Unit (EPU), using worked examples with control rules that meet some illustrative goals and objectives and b) accept the proposed approach to set EPU catch caps and functional group catch allocations although more work is needed to define the species in the functional groups. This progress and the draft Operational Framework document will be reported at the September Council meeting.

#### Introduction

Mr. Pappalardo opened the meeting at 10:10 am with a brief introduction and summary of the agenda. He said that the PDT had held several meetings and conference calls to develop the report and respond to the direction the Council established in June. Mr. Pappalardo was at most

of the meetings and said that it was worthwhile for the committee members to review the glossary at the back of the document, since there was new, unfamiliar terminology in the report.

***AGENDA ITEM 1– PDT REPORT ON AN OPERATIONAL FRAMEWORK FOR A GEORGES BANK ECOSYSTEM PRODUCTION UNIT***

Presentation

Mr. Applegate presented the committee with an overview of the steps that the Council had taken so far to develop EBFM policy and why it took the steps that it did. He showed an informal five-phase procedure from early development to implementation of a Fishery Ecosystem Plan (FEP) and adjustments by amendment. The report included a brief summary of the work that the PDT had done through the June Council meeting, which highlighted the need for an operating model to develop and evaluate ecosystem management strategies in the next development phase, incorporating a formal Management Strategy Evaluation (MSE).

Mr. Applegate reported that during the PDT's earlier work there was agreement about five general principles:

- Reference points and catch limits for an Ecosystem Production Unit (EPU) should be informed by trophic relationships and interactions, tied to the Council's risk policy that recognizes both uncertainty and potential consequences of mis-specification.
- A total system cap - The combined catch limits of all species or functional groups should not exceed a fixed percentage of primary production, about 40%.
- Aggregate, functional groups - Stocks should be managed in functional groups of ecologically related species (i.e. guilds), but individual stocks require special conservation if they become overfished or depleted.
- Management should be applied through a hierarchical place-based (i.e. spatial) framework
- A place-based management approach coupled with catch limits defined at the functional group level could be more robust to climate-induced changes in productivity and distribution.

The PDT had been focusing on five different facets or features of the draft eFEP, discussing the issue that managers and scientists would need to consider as the plan developed. These facets were presented and discussed in the following order:

- Total system catch cap and functional group catch limits
- Overfished or depleted stocks
- Forage Fish Management
- Habitat Conservation and Spatial Management
- Management Strategy Evaluation (MSE)

The presentation summarized the work that the PDT did to develop an operational framework document, including three operating models at different levels of complexity and

comprehensiveness, ranging from a 10-species length-based multispecies model to an end-to-end energetics model. Mr. Applegate pointed out that this framework document was not the eFEP itself, but an important supporting element which was requested by the committee. Mr. Applegate's report highlighted the work that the PDT did on identifying functional groups, based on trophic similarities and technical interactions with fishing fleets/gears. The report also gave a summary of the hierarchical approach to set an ecosystem catch cap based on energetic considerations, energy transfer from estimates of primary productivity and sub catch limits by functional species groups. These groups included 74 species caught on Georges Bank by the fisheries and by the trawl survey.

Dr. Fogarty followed with a more detailed presentation of the framework and operating models, with estimates of primary productivity trends and transfer coefficients. He also showed trends in biomass by trophic groups from 1970 to 2015. These were catchability-adjusted estimates derived from spring and fall surveys, which include species that are selected by the trawl gear and hence do not include other species, such as some of the pelagic elements and apex predators. He reported that the aggregate approach addresses the issue of complexity head on, applying a higher-level approach in ecological organization. Previous work approximately 30 years ago took this sort of approach to estimate a multispecies MSY for the NW Atlantic. It was thought that those estimates were too high, estimates that had been inflated by catches of species with accumulated biomass.

Dr. Fogarty pointed out that a hierarchical approach to setting catch limits had an attractive property that there is more stability at the top level than for the individual components, but that a 'floors and ceilings' approach was required to provide protection for vulnerable and depleted stocks. Dr. Fogarty gave an overview of model output from the Hydra operating model for the committee, including estimated effects of temperature change over a 20 and 50-year time horizon. As effort increased, more species were below a 'floor' threshold of 20% of unexploited biomass. The model results demonstrated that reducing effort by a little would substantially reduced the risk of depletion to individual stocks, with a slight reduction in total yield. He summed up the type of framework in the paper that it could have some favorable properties of stability, higher diversity, and more resiliency.

### Discussion

During the presentation (<http://s3.amazonaws.com/nefmc.org/2a.-Description-of-an-Operating-Model-for-a-Georges-Bank-Ecosystem.pdf>) by Dr. Fogarty, a few questions by committee members and discussion brought out some important points and considerations about the presented material.

Dr. McKenzie asked what might have been the level of productivity before 1970. He thought it would be useful to take a broader perspective on the ecosystem using information from before 1970. After 1970, the ecosystem and productivity had been disturbed by high levels of fishing, particularly the buildup of foreign fishing effort in the 1960s and 1970s. Dr. Sissenwine added a slightly different perspective that the models might be used to estimate what could have been taken before 1970 based on primary productivity and an optimal harvest strategy. Dr. Fogarty indicated that the longer historic perspective would be useful, but more recent climate effect

changes like changes in Gulf Stream positioning and the timing and strength of water stratification should also be considered. Also, previous estimates of productivity potential, like those published in the Brown et al. paper had been biased by catches that were well above sustainable levels, including catches that were an outcome of serial depletion of stocks as well as by foreign fishing. Often they also did not account for the ecosystem role and yield from shellfish.

In terms for inputting more flexibility to fish, there had been proposals for catch share systems and incentive/point approaches that offered the potential for improved performance. Dr. Sissenwine and Dr. Fogarty said that there had been a published paper on a tax and rebate scheme to balance fishery catch, but that the idea did not go far. It had some of the same properties of a catch share system, but the existing catch share systems were too restrictive to have the same sort of benefits.

Committee members were interested in the functional group classifications, particularly with some fish that transitioned to different diets as they grew. Dr. Fogarty admitted that changes in diets was important and many times are considered in the models, but often the diets were broad and diverse. The six functional group classifications included benthos, benthivores, mesoplanktivores, macroplanktivores, piscivores, and apex predators. Dr. Fogarty described their characteristics and several committee members asked about some species falling within specific groups, including spiny dogfish and haddock.

Focusing on an overall, system cap, Dr. Fogarty explained that it is now possible to estimate productivity at different levels, including nano-, pico-, and macro-plankton. The latter was the source of much of the grazing by species that are important to humans and mega-fauna. It was the level that benefited from recycled nutrients and was particularly productive for Georges Bank, an area that has shallow, well-lit water with high levels of nutrient recycling through water circulation.

Dr. Fogarty talked about setting an overall system catch cap based on energetic model results. Regardless of how species at various trophic levels were harvested, a total cap of not more than 15-20% of total productivity would be an upper limit. Dr. Sissenwine said that based on previous work, it depending on how the energy from primary production was transferred up to higher trophic levels. Earlier research indicated that for Georges Bank, an upper limit of 2-3% was thought to be high because at the time, a substantial fraction of the catch was dominated by recruits and juvenile fish.

Talking about the slide on components of a management strategy evaluation (MSE) adapted by a recent paper by Andre Punt, Dr. Sissenwine suggested consideration of a different way to structure the elements of the procedure, applying simulated data directly to control rules for testing rather than fitting the simulated operating model data to the assessment/estimation method results and then applying that to a control rule. He thought that the assessments/estimation methods could provide the performance statistics to determine how well the management strategy had performed. He felt that both procedural pathways had merit and could be considered.

Dr. Fogarty outlined several types of models that were or with further development would be available to be applied to a Georges Bank EPU, including a 21 species surplus production model and a size structured model with nine species, both applying Type II feeding behavior. He showed that small reductions in effort and yield from MSY were needed to reduce risk of depletion to individual species. Mr. Reid asked if the energetic models were able to consider changes in climate and ecosystem structure. Dr. Fogarty showed results from the Hydra model which had been adjusted to account for changes in digestion at higher temperature levels, illustrating that these effects can be incorporated into the operating models. Dr. Fogarty indicated that although setting catch levels by functional group was the proposed approach, tracking the trends in individual stock biomass was important to prevent them from getting into trouble (because the species was vulnerable to exploitation due to its life-history characteristics). He showed that assessments for individual species and trends in survey biomass could be used for status determination relative to biomass floors.

Dr. McKenzie thought that the draft document was concise, accessible, and clear with recommendations that are well supported by the literature. Working off committee questions that had been prepared by Mr. Applegate, the committee focused on further development and application of operating models as an illustration, their application to control rules and strategies, and a broad-based peer review. The committee also discussed the general strategy of establishing limits based on aggregate functional groups of species, with a system wide cap on catches.

#### **1. MOTION: Mrs. Tooley / Dr. Sissenwine moved:**

To recommend to the Council that a broad-based peer review be conducted on the proposed Georges Bank operating models (e.g. described in document 2b) and supporting data, incorporating the appropriate national and international reviewers, upon completion of operating models and worked examples of control rules for Georges Bank.

#### **Discussion on the Motion:**

After the above presentations, Mr. Applegate asked the committee to think about the questions below to provide further guidance to the PDT:

- Is the operational framework and document clear?
- What critical elements are missing?
- Is the approach of establishing an EPU catch cap and allocations amongst functional groups of species an acceptable approach?
- What do you want the EBFM PDT to do next?
- Are the data and models sufficient to test and validate real world management approaches that could be implemented as regulations?
- Is further development or parameterization (testing, peer review, etc) needed before developing a Management Strategy Evaluation (MSE) and engaging fishermen and the public?
- Who would be appropriate to provide peer review of the application of operating models to the Georges Bank EPU? When would this happen? Before starting Phase III and conducting an MSE?

- What components (described above) of an example Fishery Ecosystem Plan (eFEP) need further development before the Council is ready to engage fishermen and the public in the FEP development process?

Mr. Alexander asked whether the product undergoing a potential peer review be different than the usual process of providing catch advice through the Scientific and Statistical Committee (SSC). Mr. Applegate replied that it is a bit different in that a peer review would look at the adequacy of the models and their application to Georges Bank to provide strategic advice about management alternatives.

Mr. Alexander thought that it would need a broad-level review outside of the SSC. Mrs. Tooley agreed that a broad review of the method is needed, bringing in a wide range of expertise. She thought a peer review would be needed before we began an MSE process and we would need to resolve some of the jurisdictional issues, before Phase III began. She added that a broad range of expertise would be needed for a peer review, including scientists outside of the region or even outside of the US. Mr. Applegate said that the terms of reference would have a bearing on the type of reviewers that would be needed. Dr. McKenzie thought that some modification of the CIE supported SAW/SARC process to look at the ‘gearing’ of the models, including the different elements brought in by the Atlantis and EwE models. He felt that the models should include and evaluate non-biological results, including economic and social performance. He added that a thorough peer review before beginning a Phase III MSE process would be essential, avoiding potential pitfalls and challenges before beginning a time-consuming and expensive MSE process.

Dr. Sissenwine recommended not using the SSC as a whole for peer review because it would not be able to give the review adequate time in a one- or two-day meeting and a CIE-type review could draw on a broader range of expertise, although some SSC members would be suitable. He thought we should approach ICES for advice on conducting an international peer review. He doesn’t think that we are ready for this type of review yet, without additional work and some worked examples of how the operating models are constructed and provide strategic reference point advice. Dr. Sissenwine recommended that the peer review should not only focus on the operating models, but also how they could be applied to evaluate and establish control rules – more work that needs to be done through some worked examples using the operating models described in the draft Operating Framework document. He explained that the PDT needed to work on how the control rules for functional groups are constructed and how they relate to an eMSY, and how the status determinations are informed by assessments and/or catches and survey indices, i.e. the estimation method. The strategy should be defined by the best results from the operating model using ‘virtual world’ data, but the numerical limits would be defined by the estimation methods.

Mr. Applegate reiterated that the control rule would be structured in different ways depending on the goals and objectives that are chosen to optimize. He thought that the PDT members will have a lot of questions about constructing potential control rules without having some decisions. Mr. Applegate thought it would be helpful for the committee to define a few sets of goals and objectives that the committee would like to see developed as worked examples

Dr. Sissenwine said that applying an approach to maximize yield or maximize value, or something else, considering other types of values, that could be developed as hypothetical example. He recommended that the PDT should develop some illustrative examples, using a range of objectives. Dr. Sissenwine replied that the two extremes would be maximizing yield and another that maximize commercial revenues, with one in between with a couple of important species that maximize yield for those species. Mr. Pappalardo added paying attention to biodiversity and maintaining employment could be useful to see as worked examples.

In response to a question about why a peer review was warranted and who was requesting one, Dr. Fogarty explained that an CIE review with international representation had reviewed the modelling methods in 2012. He agreed that there would be value in conducting a detailed peer review on the application of the operating models for FEP development. The heart of the issue is the mixed species aspect of the fishery, difficulty to target specific elements within it to meet biological targets. We have much more control of fishing at the functional group levels and bringing into account the trophic interactions between species. Mr. Applegate added that an approach that applies functional group management allows for variation in the mix of species or trends when the species mix in an area changes due to climate effects. The overall framework would be more resilient to these types of changes, especially if they are structured around the way that fisheries occur in an area, providing the ability for fishermen to adapt and be flexible to changes as they occur.

The committee had concerns that this peer review would compete with the type of peer review needed for benchmark assessments, but most thought that what is being recommended is broader than that, separate from the normal review process.

#### **MOTION #1 The motion carried 6-0.**

#### **2. MOTION: Dr. McKenzie / Dr. Armstrong moved:**

That the committee recommend to the Council that the approach include establishing an EPU catch cap and developing methods of setting catch limits by functional groups of species defined by trophic interactions represents an acceptable approach for further development as an example.

#### **Discussion on the Motion:**

Dr. Sissenwine thought an important question to be addressed is how the operating models should treat externalities from species migrating from surrounding areas. He offered some thoughts about ecosystem MSY resulting from a combination of fleets and species/size selectivity, using a control measure of effort, such as days fishing. He recommends that the PDT take the optimum effort (eMSY) forward, but what does it mean in terms of ecosystem biomass for fishing mortality reference points, which should be included in a worked example. The hard part, would be the interpretation on the individual species. A worked example would illustrate a practical level of optimization, such as the guild level and the reference points that would be appropriate for them. How would that be operationalized with respect to three (or more) fleets with maximum effort and mixed selectivities on a suite of targeted species. He thought that doing this would illustrate how an ecosystem plan might look like and be managed.

Mr. Reid asked how far can an FEP deviate from the current rules, whether management by functional group would be a viable solution. He worried that we would expend a lot of work, but not be able to use it due to legal constraints. Dr. Fogarty said that more ecosystem type limits will be allowed under the new guidelines. He added that some of what is being considered is done now – an aggregate limit and management system like we have now for skates. He added that individual stock status could be monitored using an assessment or an index-based proxy allowing the management system to take corrective action when needed.

Dr. Sissenwine and Mr. Applegate reminded the committee that the Council charge was to develop an example FEP that was not necessarily constrained by current law and guidelines, so that we can identify issues that need to be addressed or modified to allow an ecosystem management approach. Mr. Applegate pointed out that management of species in a specific area, rather than throughout the range, may be a bigger legal issue than managing species via aggregate limits if there are safeguards against and/or responses to a species from becoming overfishing or unacceptably depleted.

Dr. McKenzie thought that the more challenging legal issue would be working out the details of jurisdictional management authority. While some type of congenial management approach could help, he thought that the management system needs to allow adaptation to the physical realities and changes that occur. Answering a question about stock structure, Dr. Fogarty replied that 80% of the stock assessments are conducted on a single unit stock, throughout the range, yet some of the differences in productivity that we see are regionally and temperature driven. This relates to identifying a region in the ocean that experiences the same set of ecological conditions, leading to better assessment of productivity and stock condition, at least for species that exhibit low to moderate seasonal migration.

Dr. Fogarty replied that many plans already use single species or aggregate reference points to manage a fishery. So, if what we do is legal in that context, what is being proposed for managing a system of aggregate groups would also be legal in that context. He advised that we should avoid any sense of equilibrium based reference points, especially in a changing system. At best, we have a response surface that is a function of dynamics and temperature effects. He thought our management system will be in a state of making a series of sequential one- or two-year ahead projections and basing management decisions on that short-term advice, providing for a safe level of harvest. It would be a much more dynamic system, rather than one based on equilibrium concepts. He talked about the transition from effort-based performance to functional group output controls. Dr. Sissenwine replied that the management advice will need to incorporate the estimates of fleet catchability to manage a mixed stock fishery. He advised that we need some alternative scenarios to optimize management within the constraints of ecosystem MSY with biomass floors under key species, instead of regulation-forced catchabilities required to meet single-species output controls. How would it operate in terms of the control variables, Dr. Sissenwine asked?

Mr. Applegate said that it will be important to consider the goals and objectives to determine the right balance in fisheries and selectivities to optimize the outcome. He explained that the optimum outcome is different if the goal is to optimize food production rather than maximizing



economic return or recreational fishing opportunity or reducing risk to protected species. He said that the reference points and MSY would be different depending on the outcomes we try to achieve. Some types of operating models will be better at addressing some goals than another model might be. Furthermore, the structure of the functional groups might also be determined to optimize how the strategy achieves the desired goals and objectives. Mr. Applegate clarified that the ‘allocations’ of catch might be thought of as both catch limits for functional groups as well as allocations among defined fleets to meet the goals and objectives. Mrs. Tooley asked how migratory pelagic species and shellfish would fit into the operating models and evaluation. She said that Tom Nies is always right.

Dr. Fogarty explained that most of the catches are comprised of ten or twelve species and that the surveys do a pretty good job of tracking abundance and biomass trends for these species. He admitted that it will be more difficult to track pelagic species and species that have specific hard to sample habitat requirements, such as black sea bass. He also explained that the operating models considered migratory species based on their resident time on Georges Bank, movements and transfer rates, based on catch patterns in the fisheries. Dr. Fogarty explained that for pelagic species, we will need to rely on assessments coming from the Highly Migratory Species division and taking advantage of existing assessment methodologies for shellfish stocks, e.g. scallops and lobster. He thought that we could take advantage of existing sources of information, like assessments, but reconcile them to the energetics part of the story. He explained further that the Hydra model is easily expanded to more than the 10 species in the trial version. Estimating parameters may be easier if we assess functional groups, rather than a large number of parameters for individual species or stocks.

The committee decided that it was premature to discuss allocations amongst fleets to achieve goals and objectives, although they recognized that the balance of catches amongst the functional groups is important and people will have different values that are important to them. Dr. Armstrong thought that the approach could be applied piecemeal for groups of stocks or fisheries, in addition to or instead of developing a functional group approach for all fish in the Georges Bank EPU, true to the way that the fleet operates (targeting groups of species) and trophic interactions. Mrs. Tooley was concerned with the adaptability of the functional group structure as conditions and fisheries evolve. She focused on the relationship between the scallop area rotation program and episodes of higher bycatch, such as windowpane flounder. She felt that the functional group allocations should retain some degree of flexibility and adaptation to current circumstances. Mr. Pappalardo thought that market and regulatory limits also have effects on the data used to determine species co-occurrence by gear type, spiny dogfish being one good example.

The committee agreed that this functional group approach is an appropriate basis for development as an example FEP. The committee agreed that the reference to technical interactions with fleets doesn’t need to be in the motion, but it is understood that the idea is to melt groups of trophically related species that are often caught together in a fishery operating in a specific area, informed by observer and VTR data. Dr. Armstrong said that it is important to focus in on structure as an illustration of what an ecosystem-based approach would look like. Otherwise, we will never be able to move forward.

### Other development work

Mr. Applegate explained that further work was needed to develop the MSE process and describe performance metrics is needed, left as a blank placeholder in the document. He asked the committee what areas we need to focus on in the near term, on these issues or on the application of the operating models. He added that work was needed on the jurisdictional cooperation and coordination issues. Mr. Pappalardo asked about inclusion of marine mammal considerations and factors, information that we have little or poor data. Dr. Fogarty that an area that people were researching was the importance and role of depredation, or net feeding by marine mammals. Other important information would be the trends and importance of sand lance in the ecosystem.

Mr. Applegate summarized the status of various related discussion documents structured around various ecosystem management issues. He said that the forage fished paper was pretty well developed and could be brought forward with a little more work. Another paper that defines the problems and issues related to management of a depleted or overfished stock. Mrs. Tooley thought that a first step in phase III would be a workshop on applicable goals and objectives for EBFM, following the example of the approach used for herring.

Mr. Pappalardo reminded the group that GARFO staff recommended publishing an NOI to develop a FEP early in the process. Mr. Applegate thought that doing so would be appropriate at the start of Phase III, when the Council began the MSE process when we have a good outline and description of an eFEP to examine, evaluate and discuss.

### **MOTION #1 The motion carried 6-0.**

### ***AGENDA ITEM 2– COMMENTS ON NOAA FISHERIES EBFM POLICY AND ROADMAP DOCUMENT***

#### Discussion

Mr. Applegate reported that the NOAA Fisheries Draft had been circulated to Council member for comment, but no comments had been received, thus no draft letter summarizing those comments was available for the committee meeting. He said that Mr. Nies had thought that the new draft had focused on development of a high-level strategy to be applied to FMPs, but wasn't sure if that would include the type of development work that the NEFMC was pursuing. Mr. Nies was seeking clarification on this issue from Dr. Link, NOAA Fisheries

Mr. Pappalardo asked if the committee members had any comments on the draft document and thought that the issue could be discussed during the Council meeting on Thursday, drafting a letter for approval by the Executive Committee before the October 15<sup>th</sup> deadline.

The EBFM Committee meeting began at 10:10 am adjourned at approximately 5:18 p.m.