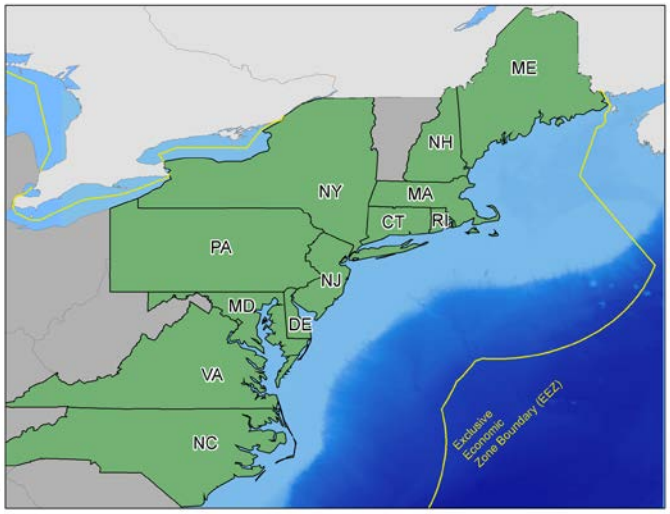
NORTHEAST REGION COORDINATING COUNCIL

SPRING 2014 MEETING

April 29-30, 2014

Hotel at Arundel Preserve -- Hanover, Maryland



Meeting Briefing Book Table of Contents

(*hyperlinked*)

Distributed via e-mail:

National Standard 2 Guidelines Revisions Final Rule

2014 SPRING NRCC MEETING AGENDA

Hotel at Arundel Preserve--Hanover, Maryland

All times are approximate

Tuesday, April 29

Noon-1205

1. Welcome, introductions, modifications and additions to agenda, announcements
   (Bullard, Karp, Ruccio)

1205-1245

2. Stock Assessment: Terms of Reference Items
   Discussion leader: Nies, Karp
   a. Clarify process for developing and approving ToRs
      i. Is process consensus based?
      ii. Is NEFMC final arbiter of ToRs content?
   b. Develop, as needed, process clarification documentation
   c. Changes to standard assessment ToRs
      i. Discuss mechanism to develop changes to standard ToRs
      ii. Discuss specific possibility of ToR to accept multiple models/results (NEFMC SSC interest)

1245-1345

3. Implementing an Assessment Prioritization Process
   Presentation: Dr. Rick Methot, NOAA Fisheries - Science Advisor for Stock Assessment
   a. Question and answer
   b. Discussion—how will prioritization work?

1345-1415

4. Stock Assessment: Process Documentation
   Discussion leader: Nies, Karp
   a. Discuss addressing revised National Standard 2 Guideline recommendations
      i. Description(s) of peer review processes used in Northeast/Greater Atlantic
      ii. *Federal Register* notice requirements
   b. Additional discussion and work plan, as needed

1415-1430: Break

1430-1700

5. Stock Assessment: Scheduling and Specific Assessment Topics
   Discussion leader: Karp
   a. Review Fall 2013 NRCC Assessment Schedule
      i. Update, as needed on previously established 2014 schedule
      ii. Discuss tentative 2015 schedule; finalize, as needed
      iii. Develop tentative 2016 schedule to be finalized at fall meeting
   b. Black Sea Bass Assessment Roadmap Discussion (Seagraves/Kerns)
      i. Review strategy
      ii. Seek consensus for process

iii. Discuss final product expectations

c. Stock Assessment Workshop (SAW) Working Group Participation.
   i. Complete the document review that was initiated at the previous NRCC meeting. Weinberg (45 min)

d. A summary of the AFSC Program Review of Models and Assessment Process. Rago (15 min)

1700 Adjourn

1800(ish): Dinner, DuClaw 7000 Arundel Mills Circle Suite R4 Hanover, MD 21076
http://www.duclaw.com/food/locations/arundel-mills/arundel-mills-menu/

Wednesday, April 30

0800-0900
Continue Day 1 Stock Assessment Related Discussions

0900-0930

6. Atlantic Herring: Offshore Spawning Sampling Program Development
   Discussion leader: Kerns, Beal
   a. ASMFC herring research section recommendation
      i. Discuss potential program
      ii. Discuss collaborative approach

0930-0945

7. Possible role of the NRCC in observer prioritization. Karp (15 min)

0945-1045 (including break, as needed)

8. Climate Change Topics
   a. Incorporating climate change considerations into stock assessment (Karp, NEFSC staff)
   b. Next steps following climate change workshop (Robins/Moore; NRCC discussion)
   c. Governance during climate change (NRCC discussion)
   d. Other climate change considerations and discussion, as needed

1100-1130

9. Vessel Upgrade Amendment
   Discussion leader: Nies
   a. Discuss potential NEFMC/MAFMC Omnibus Amendment to remove or further modify vessel length and horsepower restrictions
   b. Determine next steps, as appropriate
   c. Status update, as needed on GARFO Baseline Omnibus Amendment

1130: Break for lunch. Grab lunch nearby; bring back to meeting for working lunch
1200-1230

10. Industry Funded At-Sea Monitoring Amendment
    a. Discuss process for public, Council, and Commission input

1230-1245

11. Meeting Wrap Up
    a. Review action items
    b. Identify mid-term meeting date
    c. Identify fall meeting dates (Fall host: GARFO)
    d. Adjourn meeting

NRCC Spring Meeting 2013 Action Items

May 1 and 2, 2013—Hotel Providence, Providence, RI

Color code key:	
ASMFC	MAFMC
NEFMC	NEFSC
NERO	NRCC

1. NRCC Public Participation: Draft NRCC public participation guidance
   -Meeting announcements
   -Documents
   -Public comment and participation guidelines
   -Executive session
   -Locations and Dates

   Responsible parties: NERO, General Counsel
   Due Date: Mid-term with a potential conference call, implement by Fall 2013
   Mid-term actions: Provide comments on draft and suggestions for revised mission statement by August 15. Second draft will be provided to NRCC by September 1.
   Mid-term discussion:

- The group agreed that the document should reflect co-chairmanship (Regional Administrator and Science Director)
- The group agreed that the mission statement should be updated
- Questions posed in the draft document were highlighted and discussed
- Minor discussion about public participation, particularly on mid-term calls

2. SAW Participation Working Group:
   -Develop alternatives of membership and structural options
   -Review the ASMFC model
   -Pursue development of conflict of interest standards with GC input

   Responsible parties: NEFSC (lead), MAFMC, NEFMC, and ASMFC
   Due Date: Membership by June 1, 2013, recommendations due August 1, 2013
   Mid-term actions: Timeline revised. Recommendations will be provided by September 1.
   Mid-term discussion:

- Working group has met twice
- Recommendations document in development

3. SARC Public Comment Draft Policy
   -Revise preferred alternative based on Spring 2013 meeting discussion

   Responsible parties: NEFSC
   Due Date: June 1, 2013
   Mid-term actions: Revised draft and response to comments will be provided to the NRCC by September 1.
   Mid-term discussion:

- Comments received on the draft are constructive
- NEFSC agrees with some comments; others may require further discussion to reach a middle ground
- NRCC acknowledged that inclusion of management expertise is valuable and desired in SARC process

4. Review Operational and Research Track Assessments

   -Review recent operational assessments, and look for streamlining processes
   -Develop time and cost analysis (capacity) of benchmark vs operational/research or updates
   -Distinguish characteristics of update assessments in comparison to operational assessments
   -Examine if the current SAW/SARC process is sufficient to meet the research track requirements
   -Examine how the research priorities are properly linked and developed to Councils and Center and assessment research recommendations
   -Examine the interaction between single species assessments and ecosystem based assessments

   Responsible parties: NEFSC, MAFMC, and NEFMC
   Due Date: Mid-term update, final report at Fall 2013
   Mid-term actions: Update to be provided at Fall NRCC meeting.
   Mid-term discussion:

- Working group has been formed
- No working group meetings or development—more immediate priorities being addressed first
- Topic similar to previous ACL working group tasking
- Long term, broad thinking required to address issues

5. Governance of Fishery Stocks: 1) Discuss sub-ACL allocations of fishery stocks that are distributed across Council boundaries. 2) Examine the process of setting sub-ACLs and AMs for FMPs managed by one Council, yet impact FMPs in multiple Councils.
   Responsible parties: NEFMC and MAFMC Executive Directors
   Due Date: Report at Fall 2013 Meeting
   Mid-term actions: Update to be provided at Fall NRCC meeting.
   Mid-term discussion:

- Minor update: March 2014 workshop on governance issues associated with climate change (hosted by MAFMC)

6. Black Sea Bass: Coordination call on interim research priorities and overall research plan
   Responsible parties: NEFSC (lead), MAFMC, ASMFC
   Due Date: Mid-term update
   Mid-term actions: Update to be provided at Fall NRCC meeting.
   Mid-term discussion:

- Overview of ongoing and planned research
- Developing documentation of what is needed to inform a new benchmark assessment, including description of research event timing (similar to what was done for herring)
- Benchmark likely a few years away

7. 2014 Stock Assessment Deliverables and Timing:

   -streamlining report and delivery process
   -examine the use of recent/latent data from previous fishing years
   -need to deliver for the SSCs use prior to Sept. Council meeting

Responsible parties: NEFSC, NEFMC, MAFMC, ASMFC, and NERO
Due Date: Membership by June 1, 2013, mid-term update
Mid-term actions:

(1) Bill Karp and John Bullard will meet in the week of July 29 to discuss Georges Bank yellowtail flounder assessment issues
(2) NEFSC will develop one or more 2014 strawman assessment schedules for NRCC review. These schedules will be distributed in the week of August 19.
(3) The NRCC will hold a teleconference in the last week of August or first week of September to discuss the 2014 assessment schedule options.
(4) During the call, the NRCC will select the final 2014 assessment schedule.

Mid-term discussion:

- 2014 assessment needs exceed the available capacity. Current schedule is provided below. Many assessment-related events are scheduled to occur between June and August. Tradeoffs in schedule need to be better understood and difficult decisions need to be made by September.
- Bill Karp relayed that methods review must occur during fiscal year 2014 (ends September 30, 2014).
- Four groundfish stocks will not have catch levels in fishing year 2015 unless catch advice is provided from the SSC. These stocks need an assessment of some type to craft catch advice. Management process has very little flexibility with respect to timing.
- Georges Bank yellowtail flounder: No clear assessment solutions from ICES workshop.
- Significant pressure for benchmark GB yellowtail flounder assessment expected.
- Should discuss proactive strategies. Options: Schedule 2014 assessment or assessment review, develop list of actions being taken or developed to advance understanding of stock/progress a new assessment, communication strategies for if an assessment is or is not scheduled.
- Yellowtail flounder course of action should be discussed at September TMGC; Canada must be involved in any assessment or review-related conversations and processes.
- Catch cap accounting peer review not cancelled; however, not currently scheduled.

2014: 1st half	**2014: 2nd half**
Scallops - SARC 59, late June 2014	
Bluefish - SARC 59	
(Scallop Survey methods peer review - early 2014)	(Multisp. Groundfish Updates, Operational Assessment , **Yr and Month TBD**)
(ASMFC - Lobster peer review)	
(ASMFC - Sturgeon)	(Model Review)
(TRAC - EGB cod, EGB haddock, GB YT - June)	
(Updates: Bluef, BlkSeaBass [data update], Scup [data update], Fluke, Dog, skates, Mackerel, butterfish, tilefish, squid, silver and red hake	
(Research Track , possible topics: Cod stock structure/ stock ID, GB YT, BSB, or mackerel) -- To be Discussed	

8. <u>Review cod stock structure</u>: Report on next steps on cod stock structure based on a revisit of the cod stock structure workshop recommendations
Responsible parties: NEFSC
Due Date: June 1, 2013
Mid-term actions: NEFSC draft proposal under internal and NEFMC staff review. Draft document will be provided to the NRCC for review and comment mid-August.
Mid-term discussion:

- Overview of three phase process provided.

- Status update on phase 1 discussed.
- Additional cod stock structure work may add to 2014 workload.

Other mid-term discussions:

- Brief discussion on process to finalize ASMFC conducted assessment terms of reference
- MAFMC and ASMFC developing interim year scup ABC review (currently under multiyear specifications)

Upcoming Meeting Dates

Fall 2013 (NEFMC), October 16 and 17

Prioritizing Fish Stock Assessments

NOAA Fisheries

February 2014

TABLE OF CONTENTS

Prioritizing Fish Stock Assessments

NOAA Fisheries

February 2014

EXECUTIVE SUMMARY

Assessments for managed fish and shellfish stocks are an important core activity of NOAA Fisheries. The Magnuson-Stevens Act (MSA) requires that fisheries management be based on the best scientific information available, thus the need for stock assessments. Well-established protocols for these assessments have been developed and highly focused deliverables satisfy the MSA requirements. Stock assessments analyze fishery catch monitoring, fishery-independent surveys of fish abundance, biological and other data to produce the required outputs. These data collection and analysis activities constitute a considerable portion of the NOAA Fisheries budget and it is important that they be prioritized to focus on the most important needs.

The prioritization system described here encompasses the updating of assessments for previously assessed stocks and first time assessments for stocks that have never been assessed. Given that the status of many stocks remains listed as "unknown", a comprehensive scan across all stocks can guide priority for first time assessment among the unassessed stocks. These priorities should be based on fishery importance, ecosystem importance, biological vulnerability to overfishing, and preliminary information on fishery impact level (stock status). This simple overview of information may identify stocks of low importance and risk such that further assessment is a low priority. Some high priority assessments may not be feasible to immediately implement due to lack of data or staff.

For stocks that have been previously assessed, the prioritization approach has three components: (1) setting the target assessment level (how comprehensive an assessment is needed), (2) setting the target assessment frequency, and (3) setting the priority among stocks for conducting assessments to achieve their target levels and frequencies, given available data and assessment capacity. The factors that contribute to setting target levels, frequencies and priorities include: fishery importance, ecosystem importance, stock status, and stock biology. In addition, the recent history of new data acquisition and assessment updates contribute to deciding whether the next assessment should be conducted as an update, which uses the same approach as previous assessments and simply incorporates more recent data of the same types, or as a benchmark assessment that involves a more thorough analysis of alternative approaches and requires a more extensive peer review before accepting results.

A stock's target assessment level, e.g. degree of comprehensiveness, has a large impact on the data requirements to conduct the assessment. Stocks with high fishery importance, high ecosystem importance, and biological factors that lead to high natural fluctuations will warrant high level assessments. High level assessments typically need precise and accurate fishery

independent surveys and data on fish ages from the fishery and the surveys. These high level assessments provide more direct information on fishing mortality and on fluctuations in stock productivity (recruitment), and thus can be more accurate and provide better forecasts of needed changes in annual catch limits. Stocks at moderate levels of importance or expected fluctuations can suffice with less data-rich assessments. Some stocks will be identified as sufficiently minor components of the fishery such that their assessments need not extend beyond baseline monitoring of catch and simple indicators. At all assessment levels, there should be consideration of environmental and ecosystem factors to help distinguish natural from fishery effects on the stocks.

A stock's target assessment frequency should depend on its intrinsic variability over time as well as its importance to the fishery and ecosystem. The greatest fluctuations are expected for stocks with short life spans and high variability in productivity. Stocks with longer lifespans tend to fluctuate less because of the many age classes in the population. High fluctuations create a greater need for frequent updates in annual catch limits. Stocks with high fishery and/or ecosystem importance need more frequent assessment updates to quickly provide access to increases in abundance while keeping the chance of overfishing at an acceptable level. Target update periods are expected to typically be 1-3 years, but some may range up to about 10 years.

The priority for updating an assessment depends principally upon the degree to which it is overdue relative to its target frequency. Stocks that are more overdue will have highest priority for updates. For stocks that are equally due or overdue according to their target frequency, priority will be given to stocks that are on rebuilding plans or are at risk of overfishing or depletion. Among stocks that are still tied, priority would go to stocks that have new information indicating a drift from the previous forecast and to stocks with higher fishery importance.

It is not realistic to create a single national prioritization list because of the importance of regional fishing communities. Further complications include regional differences in total fishery value, assessment data availability, and long-standing processes for arriving at regional assessment prioritization decisions. Additional prioritization challenges are incurred for those Centers that engage in assessments with various international fishery management organizations. While the ideas presented here may be useful in those international settings, the principle focus of this prioritization process will be for domestic stocks in federal fishery management plans.

The proposed prioritization approach centers on the delivery of consistent information to each science/management group to help support and standardize their decision-making with regard to assessment priorities. This report and a database containing all the factor scores will be updated and made available to all parties involved in deliberations regarding assessment prioritization. The first time each Center works on prioritization with its respective management group (Fishery Management Council, regional or international commission, NMFS region or headquarters) may take some time, but subsequent updates should be straightforward and not require a large effort. A portfolio of assessments is expected to evolve, with some activity directed towards first-time assessments, some towards baseline monitoring of low priority stocks, some towards high quality assessments of high priority stocks, and some towards more intensive investigation of ecosystem linkages where needed.

As each region [1]deliberates on its assessment prioritization process, there also should be consideration of the process and time needed to conduct reviews of assessments and to move assessment results into implementation of management actions. It is recommended that each region conduct management strategy evaluations on a few representative stocks in order to understand the implications of stock variability, assessment imprecision, assessment frequency, and time lags between assessment and management implementation. In the future, this prioritization process can provide the necessary framework to guide wise national investments in improving survey and staffing capabilities for more accurate, precise, and timely scientific information in support of stock assessment requirements.

[1] The generic term "region" is used to refer to the group composed of a NMFS Science Center and its management partners.

BACKGROUND

SITUATION

The Magnuson-Stevens Act provides the foundation by which Fishery Management Plans (FMP) are created for fisheries that are in need of conservation and management. Each FMP lists fish stocks that are managed under that plan, and the FMP then specifies optimum yield for that fishery, criteria to determine whether overfishing is occurring or if any of the stocks have become overfished (depleted), and specifying annual catch limits such that overfishing does not occur. Determination of overfishing and overfished levels and annual catch limits is required to be guided by the best scientific information available. Fish stock assessments are designed to provide exactly the quantitative scientific information needed to determine the status of fish stocks and to guide annual catch limits.

Stock assessments are analyses of the population dynamics of the stock. Full assessments utilize catch data from fishery monitoring programs, stock abundance data from fishery-independent surveys or fishery catch rates, and data on the biology of the stock from various sources. These data feed into stock assessment models which integrate the information from the various sources and provide estimates of stock abundance, stock productivity, and fishing mortality over time. If the assessment is based on weak, imprecise data or has not been updated recently, there is a chance that it is providing guidance that is either allowing overfishing or is forgoing available fishing opportunities. It is impossible to confidently prevent overfishing while attaining a yield that is a large fraction of the theoretical Maximum Sustainable Yield (MSY) without having an accurate, precise and timely stock assessment to guide frequent adjustments to catch levels. With accurate and precise stock assessments, the recommended catch can approach the theoretical MSY while having only a small chance of overfishing. Thus, it is important that stocks for which the fishery strives to achieve as large an optimum yield as possible are supported by data-rich, frequently updated stock assessments.

Stock assessments are conducted principally by the six NMFS Science Centers in collaboration with State, Council, international and academic partners. Assessment results are delivered to the NMFS fishery managers, the Fishery Management Councils and international fishery management organizations for their use in developing recommendations for management of the fishery. Because assessments directly support the regulatory process, the assessment results can be contentious. For stocks managed under federal Fishery Management Plans, the MSA's National Standard 2 Guidelines defines the requirement for certifying that the assessment represents the best scientific information available. The reauthorization of the MSA in 2006 specifically addresses this review issue by establishing an opportunity for the Secretary of Commerce with each Council to establish a peer review process, and by designating the Council's Scientific and Statistical Committee with specific roles in providing the Council with scientific advice on fishing levels including the acceptable biological catch that would prevent overfishing. The relationship between NMFS science programs and the regional Fishery management Councils, NMFS regulatory offices and various international partners for highly migratory and other treaty-managed stocks, such as those off Antarctica, is important for successfully turning assessment data into useful management advice on a timely basis. These relationships should include an objective

process to determine which stocks are priorities for assessment, and then to effectively conduct, review, and communicate the assessment to the affected public.

Since publication of the Marine Fish Stock Assessment Improvement Plan (SAIP) (Mace et al, 2001), numerous national programs and working groups have been developed to improve assessments. These include:

- National Stock Assessment Workshops and National SSC Workshops provide a forum for development and advancement of the scientific approaches and protocols;
- Advanced Sampling Technology Working Group develops improved data collection and processing technologies;
- Fisheries Information System program management team coordinates catch monitoring nationally;
- National Observer Program and Marine Recreational Information Program do the same for at-sea observers and recreational fishery catch monitoring, respectively;
- Assessment Methods working group focuses on improvement of the analytical stock assessment methods.
- Species Information System provides a national, web-based portal to all assessments and fishery status determinations and provides outputs that can be efficiently provided to inquiries at both the regional and national level
- Fisheries and the Environment (FATE) and the Habitat Assessment Improvement Plan work to improve the inclusion of environmental, ecosystem and habitat information in assessments.

Collectively, these national groups achieve a federated stock assessment enterprise under the leadership of the NMFS Science Board. This assessment enterprise meets national mandates established by the MSA and other legislation and executive orders, and is responsive to regional assessment needs and opportunities.

The cost associated with conducting a particular assessment is complicated. Each assessment is not an individually contracted task. There is a complex, many-to-many relationship between the several assessments conducted in each region and the several multi-species data sources that support those assessments. Most funds go into large scale, long-term data collection programs that simultaneously collect data on many co-occurring stocks. Assessment programs encompass a broad portfolio of activities from basic fishery data collection, to surveys, conducting standard assessments, and studies to improve consideration of ecosystem, environmental and habitat effects on fish stocks. The fishery-dependent aspect of the overall program is conducted in strong partnership between the Science Centers, Regional Offices, coastal states and marine fisheries commissions and Councils. The fishery-independent aspect of the program is partially conducted through use of the NOAA OMAO Fishery Survey Vessels, as well as fishing vessels contracted by the Science Centers and various partners, state surveys, and cooperative research programs. Further the costs of conducting assessments vary tremendously depending on the type of assessment, size of the stock, its range and habitat. The many-to-many relationship between funding of data collection programs and resultant assessment outcomes confounds detailed budget accounting. Thus, identification of which assessments would be conducted on the basis of new funds is fundamentally fuzzy. New funds build regional assessment capacity, including expanded

data collection. The returns on these investments result in improved assessment output some years hence depending on the specifics of the situation.

The SAIP in 2001 provided a baseline description of the NOAA Fisheries' stock assessment enterprise. It set the goal of at least baseline monitoring (basically just catch and perhaps some simple indicators) for all stocks, standard assessments for core stocks, ecosystem-linked assessments for select stocks. The SAIP defined five levels at which an assessment could be conducted:

1. Assessment based on empirical trends in relative stock abundance;
2. Assessment based on a snapshot equilibrium calculation;
3. Assessment based on time series of catch and an abundance index to support application of a dynamic model;
4. Assessment is age-structured, so needs time series of age and/or size data and can now estimate changes in fishery characteristics over time and can estimate fluctuations in annual recruitment, and has direct information on the fishing mortality of each year class entering the stock;
5. These assessments link to ecosystem, habitat or climate factors to help explain and forecast the fluctuations that are empirically measured in a level 3 or 4 assessment.

Today, assessments at level 3 are generally considered to be able to determine overfishing and overfished status, but are marginal for the purpose of forecasting changes in annual catch limits. Most assessments are conducted at level 4 today and a few have achieved a level 5 status. Several different modeling approaches are used, but there has been evolution towards models that are internally age-structured but very flexible in data requirements. A revision of these levels is underway as an update of the SAIP.

Need For Prioritization

The demand for rapid updating of assessments became acute with the requirement for annual catch limits in all fisheries. If stocks fluctuate in abundance and an annual catch limit is to be set at a level that will attain a target level of fishing mortality, then the ACL must be updated sufficiently close to the onset of a fishing season in order to take advantage of timely information on the forecast abundance of the fish stock. This is because the ACL is effectively the product of a target fishing mortality level (F) and the forecast of the available stock biomass (B) in the upcoming fishing year. So if the actual B in the upcoming year differs from the forecast B, then catching the ACL will over- or under-achieve the target F level. Hence, consideration of the target assessment frequency should also take into account the time it takes to make management updates (including ACL adjustments) on the basis of assessment updates. Where there are high fluctuations in B, there is greater need for shortening the timeframe between data collection and management implementation. For example, to the assessment to management transition is just a few months for short-lived species like Pacific salmon managed by the Pacific Fishery Management Council and by the US-Canada process managing the highly fluctuating Pacific whiting stock which begins entering the U.S. fishery at age 2. Other regions have developed short-turnaround processes for some key stocks, but there are insufficient resources to assess all stocks on an annual basis, and many stocks

do not need annual assessments. Hence an objective and quantitative approach for establishing assessment priorities is necessary.

NMFS Science Centers have recognized the need for prioritization and streamlining of the assessment process. For example, the Northeast Fisheries Science Center, at the request of the Northeast Regional Coordinating Committee, created and used a revised process in conducting assessment updates in 2012 (NEFSC, 2012). A particular focus of this revision was an effort to move more assessments from a time-intensive benchmark assessment process, to a streamlined update process. Many of the concepts embodied in the NE process are represented in the national prioritization process presented here.

Other nations have also recognized the need for coordinating the pace of assessments and the expectations for timeliness of management updates. In Australia, Dowling et al. (2013) investigated the historical patterns of investment to attempt to better understand the trade-off between research and management costs, risk to the stock and ecosystem, and level of allowable catch. In Europe, the ICES organization formed a working group (WKFREQ) to investigate factors that could allow for reduced frequency from their typical annual assessment updates (ICES, 2012). In 2011, ICES conducted annual assessment updates for 144 stocks and biannual assessments for 48 stocks, thus nearly twice the number of assessments than are conducted in the U.S. each year The ICES report reached the following conclusion with regard to reducing assessment frequency and deriving multi-year management advice from some assessments:

> *"WKFREQ suggests that multiannual management approaches can only be considered for a limited subset of ICES stocks, namely those with robust assessments and modest exploitation, those with a limited amount of new information each year, those with very noisy data, those in which management is only weakly directed by assessments, and those in which individuals are very long lived and exploitation is (again) modest. Stocks in any other circumstances are unlikely to be suitable for a multiannual approach.*
>
> *Even in suitable cases, the risk of changing to a multiannual system needs to be evaluated using a quantitative approach such as an Management Strategy Evaluation. Such an evaluation needs to consider the assessment model used and its uncertainty, survey and recruitment variability, the initial state and trajectory of the stock, the management approach used, how well the fishery performs economically, and more qualitative aspects such as political sensitivity. An evaluation that ignores one or more of these aspects in determining suitability may well reach the wrong conclusion, with potentially damaging consequences."*

The U.S. situation differs from the European situation in that we have been successful in reducing overfishing, thus achieving a more modest exploitation rate for more stocks, a situation that is more amenable to reduced assessment frequency. Nevertheless, the WKFREQ recommendation for Management Strategy Evaluation holds true for the U.S. as well. A prioritization system informed by MSE will be more objective and transparent as to its expected benefits.

Scope: Stocks and Regional Scale

The species (stocks) to be considered in an assessment prioritization scheme are numerous and diverse. In some cases, a managed stock is a geographic subset of a species. In other cases, the

stock is a complex containing a few to many species. The total number would be greater than 1000 if all species within complexes were counted individually. The fact that some species have been lumped into a complex for management purposes does not completely discharge stewardship responsibility to assure that members of the complex are not being unduly affected by the fishery. Across the nation, FMPs have varied tremendously in the degree to which they have included species within the plans. Some are single-species plans and some include a wide range of species that are targets of the fishery or associated with these target species in some way. In some cases, the FMPs have included a large number of co-occurring species which, by their inclusion, would inherit the requirements for status determinations and annual catch limits. The 2009 update of the National Standard 1 Guidelines recognized this conundrum and established a category termed "ecosystem component species". A species can be placed in the ecosystem component category if it is not targeted or retained by the fishery and its level of bycatch is determined to have a negligible impact to the stock. Thus, a low-level stock assessment is to determine if a species is a member of a management unit or is an ecosystem component species . In 2013, there are 478 managed stocks and stock complexes in the fishery management plans.

The species scope for this plan is also complicated by our engagement in the international arena. In some cases the managed stocks are included in fishery management plans, but the assessments occur in an international working group setting that is not under Council or NMFS control and involves factors that would not be easily incorporated into a US domestic prioritization process. In other cases, there are internationally managed stocks such as CCAMLR managed Antarctic stocks, that are outside of FMPs but still require use of US assessment resources.

In 2005, the Fish Stock Sustainability Index (FSSI) was created and the 230 stocks included in this index effectively became the previously undefined "core" stocks from the SAIP. FSSI stocks contribute 90% of the catch, although some stocks are on this list because of a history of overfishing or other reasons to establish importance. A Departmental-level performance measure was created to track progress in improving the FSSI and in providing adequate assessments for these 230 FSSI stocks. An adequate assessment is considered to be one that can provide information relative to status determination criteria[2] on both overfishing and overfished status (SAIP level 3), has been updated within the past 5 years, and has been validated as best scientific information by a review process. The breakout of stocks and stock complexes is shown in Table 1. They are unequally distributed among the jurisdictions of NMFS regions, regional Fishery Management Councils, and Fishery Management Plans. These 46 FMPs each contain from 1 to many tens of managed stocks.

The proposed schedule for application of the prioritization process would have each Center take a tiered approach with their respective Regional Council or other partners to cover all stocks in their jurisdiction. The first tier would cover the domestically assessed and managed FSSI stocks. The second tier would extend to other managed stocks, species within managed stock complexes, ecosystem component stocks, non-FMP internationally managed stocks, and state/commissioned managed stocks as appropriate for the particular Center.

[2] Note that level 1 and 2 assessments support some status determinations and status determinations are retained even when assessments are more than 5 years old.

We propose to take a regional scope to prioritization because of the large challenge in calculating each stock's contribution to national benefits. Optimum yield from fisheries should be defined in terms of benefits to the nation, so it is logical that the prioritization of assessments also be in national terms. In practice, however, the degree to which social, economic, ecological and biological analyses can quantify optimum yield in terms of benefits to the nation is quite limited. The importance of regional communities is a challenge to quantify. Typically, optimum yield is defined only in terms of an amount of catch for a particular stock and is not even extended to a multi-species analysis within an FMP. Consequently, it will not be feasible to quantitatively define absolute priorities for stock assessment at a national level. The assessment prioritization process described here will focus on facilitating the standardization of regional prioritization processes and providing a national reporting system for the results of this regional prioritization. Higher level decisions regarding allocation of national resources between regions can be guided indirectly by the results of the regional prioritization.

PRIORITIZATION OVERVIEW

In brief, the proposed prioritization process involves the following steps:

1. Target Assessment Level and Frequency: Among unassessed and previously assessed stocks, set medium-term assessment goals
   - Among stocks that never have been assessed, set priority for first-time assessment, if any, or conclude that current level of baseline monitoring is sufficient.
   - For stocks that need assessment, set target assessment level; this drives the data requirements
   - Set target assessment update frequency for each stock
2. Prioritize to Achieve Targets: Annually update priorities for conducting assessments, with a portfolio approach to allocate assessment capacity to achieve a mix of first-time, benchmark, and update assessments:
   - Benchmark assessments for assessments needing improvement or for which new data will allow advancing to higher level;
   - Update assessments for stocks that are at or exceed their target update period.

The Target-Setting stage is important because it is not possible to prioritize without having clear targets to be achieved. These targets relate to how comprehensive the assessment should be (e.g. its assessment level) and how frequently it should be updated. While it is inevitable that current data availability will influence consideration of a stock's target level, this should not be an overriding influence. It will be better to establish goals that are independent of current data and then to consider the gap between current data and the stock's goal. The Prioritization stage then directs assessment efforts to accomplish these targets. The "First Time Assessments" distinction is needed because it is not realistic to establish a single set of factors that encompasses both the updating of assessments for previously assessed stocks and first time assessments for stocks that have never been assessed. For stocks that have never been assessed, we lack the information needed to establish longer-term expectations for its assessment level and frequency. In the sections

below, we will first describe the factors to be considered in the process, and then describe how these factors are used to assign targets and priorities to stocks.

FACTORS TO CONSIDER IN TARGET SETTING AND PRIORITIZATION

The major factors that influence the setting of assessment targets and priorities are described in this section and summarized in Table 2. These factors are:

1. fishery importance (commercial and recreational value to the regional fishing communities, with additional considerations);
2. ecosystem importance (role of the stock in the ecosystem and strength of its interactions with other species);
3. stock status (relative to target and limit levels of abundance and fishing mortality);
4. stock biology (how much change is expected per year, on average);
5. history of assessment, including availability of new information to resolve extant issues or indicate a change in stock abundance.

FISHERY IMPORTANCE

Fishery importance on a per stock basis would best be described in terms of benefits to the nation from fishing activities affecting that stock. As described earlier, it is not feasible to quantify importance in these terms, nor would it be politically feasible to create a system that ignored the regional importance to coastal fishing communities. It would be ideal to be able to calculate the incremental value to the nation of conducting an assessment on one stock versus another stock, but such a detailed economic analysis is not feasible. Consequently, the proposed system described here will use both commercial landed value and recreational catch, while providing an opportunity to adjust a stock's importance level according to less quantifiable factors, including stocks that are limiting factors in mixed stock fisheries, stocks that have recognizable non-catch value to society, and stocks that contribute to subsistence fisheries. Importantly, the commercial and recreational scores will be provided separately and not explicitly added together.

For a stock's commercial importance, the landed value of the catch will be the data from which a non-linear ranking would be calculated. If raw catch value is used, then the most valuable stocks would overwhelm the low valued stocks and there would be little ability for other factors to establish a priority for assessment of the low valued stocks, for which there still is a mandated need to prevent overfishing. On the other hand, if the stock-specific catch values were binned into categories with equal numbers of stocks and bins were assigned scores of 1 to 5, then then high value stocks would receive only a small amount of higher priority than the low value stocks. The proposed progressive score transforms the raw catch values as $\log_{10}(1.0 + \text{landed value})$ to reduce the range, and then scales this range to have a maximum value of 5.0.

Although good databases with commercial catch by species are available, commercial and recreational catch values on a stock-specific basis for all stocks are not readily available. A preliminary exercise collected catch information from each region for all stocks in 2009. It is used here to demonstrate some general characteristics of the range of catch across stocks. Annual updating of this stock-specific catch information is underway to provide commercial and

recreational catch relative to annual catch limits. These data will be used for the prioritization process when they become available.

An example exercise for fishery importance used the commercial domestic landed catch amount in 1000s of pounds of whole weight for 2009. On this basis, stocks with a catch of approximately 100 million lbs would have a score of 4.0 (after rescaling so that the maximum score would be 5.0), 5.5 million for a score of 3, 310 thousand for a score of 2, and 16 thousand for a score of 1.0. With this approach, many FSSI stocks would have values in the range of 2-3 (Figure 1a), and most non-FSSI stocks would have values less than 1.0, and many would score near 0. Note however that some of these zero scores were because catch data on some of the minor, unassessed stocks were not available.

Recreational catch in 2009 was processed in the same way as the commercial catch, e.g. the recreational score is $\log_{10}$(1.0 + retained catch in 1000 lbs), then scaled to have a maximum score of 5.0. As with commercial, this is done on a national basis. There are 134 FSSI stocks and 215 non-FSSI stocks for which we found no reported recreational catch in 2009 (Figure 1b). The top three recreational stocks (Table 3), with catches of 9-17 million pounds, were: Summer flounder - Mid-Atlantic Coast, Bluefish - Atlantic Coast, and Yellowfin tuna - Central Western Pacific.

Scaling each of commercial and recreational to have a maximum scale of 5.0 on a national basis has desirable characteristics for this exercise, but should not be interpreted as a judgment that commercial and recreational value are of equal importance. It would take a very involved economic analysis to actually place recreational value on the same basis as commercial value. Consequently, the commercial and recreational scores will be kept separate. With catch ranked nationally in this way it is still feasible to use the national values within each region or within FMP. By using a maximum of 5.0 for each, this essentially places commercial and recreational importance on the same scale nationally, however this will play out differently within each region as these scores are used to actually assign assessment priorities. Off Alaska, recreational catch of federally managed stocks is very small compared to commercial catch so the low recreational score for all stocks will have negligible effect on the relative ranking of stocks. Whereas in the Southeast, recreational catch is greater than commercial catch for many stocks, so both the commercial and recreational rankings will have an impact on prioritization. The scaling of commercial versus recreational value and the inclusion of non-catch and subsistence would need further attention if comparisons between regions are to be considered.

Figure 2 shows that the stocks with highest recreational score nationally tend to have at least a moderate score on the commercial scale. This is true for both the FSSI stocks and for the non-FSSI stocks. On the other hand, stocks with the highest commercial score nationally tend to have very low recreational catch.

The values displayed here have been based on landed catch amount, not value, and have only been displayed nationally, not regionally, so these figures and lists are preliminary and will certainly change as landed value, not catch, is used as the common metric.

Fishery Importance Modifiers

In addition to the commercial and recreational score, additional factors can contribute to the fishery importance score for a stock. These include:

- +1.0 for stocks on rebuilding plans because their recent catch value is depressed below long-term potential;
- +1.0 for stocks that have a particularly high constituent demand for excellence in stock assessment. For example, stocks that are in catch shares programs or stocks that are in a multi-stock fishery and their status is limiting the fishery's ability to harvest more productive stocks in that multi-stock fishery. In this case, good assessment of the smaller, less valuable stock is important to prevent undue restriction on harvesting of the more valuable stock. A cap on the percentage of stocks that can receive this bonus will need to be established to prevent excessive usage rendering it meaningless.
- +1.0 for stocks that have a high non-catch value (for example underwater viewing of reef fish).
- +1.0 for stocks important to subsistence fishing.

ECOSYSTEM IMPORTANCE

All species have ecosystem importance but their importance increases if they constitute a major forage species for one or more managed species, or if their role as a predator is important for structuring ecosystems, including changing the natural mortality rate of other species. Importance would increase further if the forage species was critical for an endangered or protected species. The ability to define ecosystem importance for predator species is more difficult since the consequences of apex predator depletion are often difficult to trace, much less quantify. However a mixture of food habits data, basic ecological information and model exploration (when available) can usually identify ecosystem components that have potential or likely substantive impacts on predation mortality rates or community structure. As the data and models to make such determinations are evolving, default scores of 1 are likely to be most reasonable for most species in the absence of evidence of some sort to the contrary.

Ecosystem Score considers both bottom up and top down possibilities where:

"Bottom-up" (Forage or habitat) score

1. if only a minor dietary or habitat provider for managed stocks (e.g., Pacific grenadier)
2. if major dietary or habitat component for one or more managed stocks (e.g., Pacific cod, corals)
3. if major dietary or habitat component for a broad range of managed stocks, or an endangered or otherwise protected and vulnerable stock (e.g., walleye pollock, skipjack tuna, menhaden, krill, shrimp)

"Top-down" (predator/ecosystem interaction) score

1. if change in abundance would likely have minor or unmeasurable impacts on other managed stocks (e.g., splitnose rockfish)

2. if change in abundance would likely have notable changes in predation mortality, recruitment or other vital rates for one or more managed stocks (e.g., lingcod, marlin)
3. if change in abundance would likely result in substantive changes in predation mortality, recruitment or other vital rates for one or several managed stocks (e.g., arrowtooth flounder in Gulf of Alaska).

Ecosystem score = maximum of above scores, so could be up to 3. Assignment of scores will need to be an iterative process to achieve a balanced approach across regions.

Ecosystem Effects

The discussion above with regard to ecosystems is based upon the degree to which harvested fish stocks are important to ecosystems, thus harvest levels for these fish stocks must be managed to protect the ecosystem of which they are members. The converse is also true; changes in the ecosystem, climate, and habitat will affect the productivity of fish stocks and better assessments will take these effects directly into account. More complete single species stock assessments are designed to be flexible enough to track the fish stock's response to these factors, but the assessments do not include the factors directly, so their response at best will lag behind true changes and forecasts can be biased. Here in this prioritization document, we have not attempted to include the need for studies to better understand these effects on fish stocks and to incorporate them directly into the assessments. NOAA recognizes the need for such work, otherwise we risk losing sight of the forest while focusing too closely on the trees. At this time, NOAA Fisheries is working on an update to the Stock Assessment Improvement Plan (2001). There the issue of expanding assessments to more directly account for these effects will be addressed. Future evolution of a prioritization process should seek a more broadly balanced portfolio that includes such ecosystem work.

Stock Status

The stock's status is based on the most recent estimates of the stock's abundance (spawning biomass, SB) and fishing mortality rate (F) relative to limits and targets for these quantities. For stocks that have previously been assessed, the intent would be to use the results of the most recent assessment to guide the importance of conducting an update of that assessment. The minimum score is 2 for a stock that has a low F, is abundant, and is not on a rebuilding plan. The maximum score is 9 for a stock that is overfished, is experiencing overfishing, and is on a rebuilding plan. Stocks that are near their target level of F and SB will have a score of 4. Stocks that are currently unknown with regard F and SB will have a score of 6.

F Category	Score		Abundance Category	Score
LOW IMPACT $F_C <= 0.25*F_{MSY}$	1		ABOVE TARGET $SB_C > 1.25*SB_{MSY}$	1
MODERATE IMPACT $0.25*F_{MSY} < F_C <= 0.9*F_{MSY}$	2		NEAR TARGET $MSST < SB_C < =1.25*SB_{MSY}$	2
CAUTION or UNKNOWN $F_C <> F_{MSY}$ is unknown	3		CAUTION or UNKNOWN $SB_C <>$ MSST is unknown	3
HIGH IMPACT $F_C > 0.9*F_{MSY}$	4		OVERFISHED $SB_C <=$ MSST	4
			On Rebuilding Plan	" +1"

Where:

F_C is the most recent (e.g. current) fishing mortality rate

SB_C is the most recent spawning biomass

SB_{MSY} is the target spawning biomass level, or suitable proxy such as 40% of $SB_{unfished}$

F_{MSY} is the limit fishing mortality rate, or suitable proxy, above which overfishing is occurring

MSST is the limit spawning biomass level, or suitable proxy, below which overfished status occurs.

Among 220 assessed stocks with information on F/Fmsy in 2013, the range of values is displayed in Figure 3. 88% have F/Fmsy < 1.0. Below that level, there is no obvious clustering or breakpoints; stocks are nearly uniformly distributed according to this ratio as shown by the nearly linear pattern for the lower 80% of the stocks. There are 187 stocks in 2013 with information on B/Bmsy. Of these, there are 49% with B/Bmsy > 1.25 and 65% with B/Bmsy > 1.00.

Over time, the boundaries between the levels may needed to be adjusted, or replaced by a system that uses the estimated ratios directly rather than use scores associated with binned values. For example, the F score could be equal to 4.0*F/Fmsy, and the B score could be 2.0*Bmsy/B (note the inverted ratio). For now, the binned approach has the advantage of providing a scoring system even when only approximate values are available.

STOCK BIOLOGY

The consideration of stock biology is important because it sets the scale for how much the stock abundance, and hence its ACL, is expected to change between assessments. This will be a factor in determining the types of data needed and a primary factor in setting the target frequency of assessment updates. There are two counter-acting forces to consider.

- One factor is the annual fluctuations in recruitment of young fish into the stock. This "recruitment variability" has a coefficient of variation often near 60% and can be greater than 100% for some stocks. Stocks may also fluctuate over time if there are changes in adult natural mortality and/or growth.
- The counter-acting force is the inertia to change that result from the fact that there typically are many age groups in the stock, so the total stock abundance tends to average out the fluctuations. When adult mortality is high, the occurrence of older age

groups is diminished. Since the goal is inertia that opposes too frequent changes in annual catch limits, a suitable proxy is the mean age of fish in the catch multiplied by some factor to be determined later. The mean age should be measured as an average over several years to smooth out the effect of recruitment fluctuations, and in cases where it cannot be directly calculated, it should be estimated from life history correlates.

For the purposes of setting target levels for various data types (see Target Assessment Level below), it is suitable to simply categorize stocks as having a low, moderate, or high expected degree of fluctuation. For the purposes of setting the target period between assessments, the protocol will use the mean age of fish in the catch multiplied by a factor, and then to add or subtract one year based on the degree of recruitment variability.

Another aspect of stock biology that was considered, but not quantitatively included here, is the susceptibility of the stock to the adverse effects of overfishing. Here the arguments with regard to overfishing and overfished are different, but both related to the inertia concept. For short-lived stocks, which have high natural mortality rates, the target levels of fishing mortality are correspondingly high, and the fraction of the stock that is caught each year is high. Thus, if the ACL is set too high due to scientific uncertainty, or it is exceeded, then the fraction of the stock that escapes the fishery could be quite low. If the stock is able to continue to produce good recruitment from this low spawning biomass (i.e. high recruitment resiliency), then it should recover quickly from this overfishing event. On the other end of the spectrum are stocks with low natural mortality rates and low target fishing mortality rates (sometimes <5% of the available stock). In this case, a one year excess catch will have little impact on the fraction of the stock that escapes the fishery that year. However, if the assessment is not updated for several years, or the same assessment bias persists for several assessment updates, then the catch overage will compound annually. Although such long-lived stocks are only slowly affected by short-term moderate overfishing, if they do decline into an overfished condition then it could take many years for them to rebuild because annual recruitment is a small fraction of the standing stock. The Productivity-Susceptibility Analysis (PSA) (Patrick et al. 2010) includes vulnerability due to slow-recovery and low M, and will be used in the examination of stocks for first-time assessments in the next section. For the prioritization of previously assessed stocks, we have not included the PSA score directly because several of the PSA factors (natural mortality rate, F/Fmsy, etc.) are already included elsewhere in the prioritization.

History of Assessment and New Information

Some new information is simply the addition of a new data point to the end of a time series in order to track changes in the stock. These new data will not perfectly match the forecast from the previous assessment because of two primary factors. One is that all data have some measurement error so they individually will not perfectly represent the state of the fish stock. The other is that all models are simplifications of the processes in nature so cannot take into account all factors that cause changes in fish stocks over time; if the forecasts could be perfect, new data would not be needed. So the new data are used to update the calibration of the model, but the updated model should not overreact to the new data because all data have measurement error. Assessment models are designed to get a good balance between tracking the process over time while not getting off

track due to noisy data. When data are noisy, it is best to wait a few years to accumulate data points to better average out the noise. But when data are of high quality, then they can be used to quickly update stock status.

Another kind of new information is of a more fundamental nature. For example, the introduction of a new survey that directly measures fish abundance, or the completion of a new research project that provides a more accurate measure of natural mortality. When situations like this occur, then it is important to conduct an assessment to take into account this new information. However, all assessments have some number of factors, such as natural mortality, for which the information has uncertainty. It is not useful to simply redo the assessment to re-examine these issues unless it is known ahead of time that new information to help resolve the issue will be available. Otherwise, the assessment effort is better directed to other stocks.

Prioritization Process

The prioritization process uses the above factors in two steps. First is the setting of goals for the comprehensiveness and timeliness of assessments for each stock (Figure 4). This needs to be done as an initial step and updated occasionally, but not annually. This step includes consideration of which stocks need assessments and which of these assessments can be simple baseline monitoring. It is expected that these goals will outreach current capacity to conduct assessments. The second prioritization step is near annual evaluation of changing stock status, new information, fishery importance, etc. in order to establish priorities for conducting assessments (Figure 5) to achieve, to the extent possible, goals of comprehensiveness and timeliness.

Setting Assessment Goals

First-Time Assessments

Many stocks, most with low amounts of catch, have never been assessed and have little data suitable for use in an assessment. Consequently, much of the information needed to establish targets and priorities for future assessments are not available. These unassessed stocks need a quick examination to determine which of these can stay at an unassessed level, which can be adequately tracked with simple baseline monitoring, and which need a first time assessment. Two recently developed tools can assist in this task.

One tool is the Productivity-Susceptibility Analysis (PSA) (Patrick et al., 2010). This procedure looks at simple information regarding the productivity of each stock and its exposure (susceptibility) to the fishery. Together these produce a score that ranks stocks according to their vulnerability to being overfished. Application of this procedure can identify those stocks that are potentially at risk and thus in need of assessment to provide a more complete evaluation of the status of the stock.

Another useful tool is designed to provide a data-poor approach to setting an Annual Catch Limit (Only Reliable Catch – ORCS) (Berkson et al., 2011). This tool looks at available information

regarding catch, other species in the fishery, and simple indicators of trends in stock abundance (see Table 4 which reproduces Table 4 from the ORCS report). It evaluates whether recent exploitation rate is light, moderate, or heavy; then provides advice on an Annual Catch Limit that should prevent overfishing until a more complete assessment can be completed.

The priority for first-time assessment of stocks can then be based on the PSA's biological vulnerability to overfishing, the ORCS' information on fishery impact level (stock status), and fishery and ecosystem importance. PSA scores range from 1.0 for the lowest vulnerability to 3.0 for the highest vulnerability. The ORCS score for exploitation status also ranges up to a maximum value of 3.0. These two scores will be added to a fishery importance score and ecosystem importance score to obtain an overall score. In some cases, data to even implement PSA and ORCS will be lacking and expert judgment will be needed. The result will be a set of scores within a region to rank stocks according to their need for a first time assessment. Some of these will show a high need, but sufficient data to conduct the assessment may be lacking. Others may have sufficient data for an assessment, usually because data has been collected by a multi-species sampling program that provides data on all encountered species. Some species will score low on this scale, so have low priority for immediate assessment. They should not be ignored. Baseline monitoring to the extent feasible should continue and PSA and ORCS should be updated on a 5-10 year basis.

Previously Assessed Stocks

After a stock has been assessed once, there should be enough information available to evaluate medium term goals for future assessments. Ideally the goal would be stated in terms of a desired degree of statistical confidence in assessment results. While many assessments present results with confidence intervals, the methods are too diverse to support direct comparison and all are not yet able to incorporate the effect of changing ecosystem factors on uncertainty in assessment results. Consequently, a simpler approach is to establish a target for the comprehensiveness (level) of each assessment, and a target frequency for updating the assessment.

Level and frequency are considered separately because the types of resources needed to accomplish them are quite different. Increasing the level of an assessment generally requires acquiring a new kind of information. For example, going to an age-based assessment requires routine collection of data on fish ages. Addition of fishery-independent survey is another type of investment that can improve assessments. Increasing the frequency of assessments does not require new kinds of data, but does require addressing bottlenecks that impede conducting more assessments each year. For example, these bottlenecks could be more age readers to process existing age samples more quickly, more scientists to simultaneously work on more assessment updates, and/or better assessment standardization to streamline the assessment review process.

Target Assessment Level

High level assessments that need more types of data should be reserved for situations with high ecosystem importance, high fishery importance, and/or biological factors that create a high level of natural fluctuations. Stocks that are only moderately important to the fishery and ecosystem and which are not expected to fluctuate much in abundance (and hence ACL) can suffice with a lower level assessment and may not warrant the extra expense to develop a targeted fishery-independent survey and collect extensive age data in order to conduct a higher level assessment.

Fishery importance affects the target level because higher assessment levels (e.g. with routine age-structured data) are more responsive to changing conditions, so can more closely track stock abundance for these high value stocks. Models that use age data can have improved forecasts of upcoming changes in stock abundance and potential yield. Low value stocks are unlikely to warrant the extra expense for collection of age data or instituting a dedicated fishery-independent survey. High value species tend to be more abundant and thus easier to survey because they are detected in most samples. Paradoxically, species that are less common are difficult to survey because their low encounter rate means that even more sampling stations may be needed to attain adequate precision. Fortunately, many fishery-independent surveys are able to simultaneously collect data on a wide range of species regardless of their value to the fishery.

Stocks with high ecosystem importance warrant higher level assessments to guard against ecosystem harm. Assessments backed by fishery-independent surveys and age composition are better able to investigate ecosystem interactions and work towards taking these interactions into account in the assessment.

The biology of the stock influences the assessment level. Stocks with high fluctuations in productivity benefit from age-structured assessments that can better track and forecast the fluctuations. These stocks are exhibiting sensitivity to ecosystem/habitat/climate shifts that warrant age-structured assessments to track these fluctuations and perhaps ecosystem investigations to incorporate the factors causing the fluctuations into the assessment. Note that a stock's sensitivity to ecosystem and environmental change is different from a stock's importance to the ecosystem.

Additional types of data allow for improved assessment calibration. Some assessments simply use a sufficiently long time series of a fishery-dependent stock abundance indicator and catch to calculate the degree to which changing levels of catch cause changes in the stock indicator. A more important stock may warrant requesting a more expensive fishery-independent stock abundance indicator, rather than a fishery-dependent indicator, to have more confidence in the standardization of the indicator over long time periods. Moving to an age-based assessment can provide a more direct indicator of the level of fishing mortality and an ability to account for natural fluctuations in stock productivity (recruitment). These assessments require addition of size and/or age data. These data require biological sampling of the fisheries and surveys, followed by laboratory processing to determine the ages of the sampled fish. Where time series are short and not informative about the impact of the fishery on the stock, then addition of advanced technology data collection can provide a directly calibrated measure of fish abundance. Where changes in fish stocks over time are not explainable simply by fishery effects, then addition of information about changing ecosystem/environmental/ habitat factors can help resolve the impact of fisheries.

The assessment levels in the SAIP (Mace et al, 2001) were described in terms of the type of model used. Separate factors were used to score the quality of the fishery-dependent biological data and the fishery-independent survey data. Since that time, evolution of assessment software has blurred these assessment model levels such that it now seems more important to focus on the types of data available than the model itself. For the purposes of prioritization, a system that relates directly to possible investment decisions is more pertinent. Higher levels of assessment modeling require more types of data and it is the acquisition of these data on an ongoing basis that constitutes much of the cost of more comprehensive and more completely calibrated assessments. The SAIP is currently being updated and a revision of the categorization used to describe the level of data available for each stock will be included and then used for this prioritization process also. While the SAIP will be descriptive of the current state of data availability, the prioritization process will add consideration of whether this state is satisfactory or if improvements are needed.

These target assessment levels will serve two purposes. First, as new data become available to move a stock up to its target level for a data type, then priority for updating that stock's assessment to use these new data will increase. Second, investment decisions can be guided by the gap between current data availability and the data needed for that target level.

Target Assessment Frequency

The period between assessments defines how closely the assessment will be able to track fluctuations in stock abundance and to forecast corresponding changes in the annual catch limit. Stocks with short life spans and/or high fluctuations in productivity are most in need of frequent updating to keep catch limits up-to-date. Fishery importance also is recognized as a factor in the frequency of updates.

One paradox occurs when the survey or fishery data used to track stock abundance are noisy relative to the magnitude of the real fluctuations in the stock. Often the new survey result will lead to constituent requests to quickly update the assessment because the data seem to indicate a change in stock abundance. Unfortunately, the models will tend to track the noise in the latest datum and cause excessive fluctuations in management advice. A better response when the signal/noise ratio is low could be to slow down the frequency of assessment updates so that a modified assessment setup is better able to smooth out these data fluctuations and provide more stable management advice. Ideally, one would conduct a management strategy evaluation to determine the degree to which uncertainty in the assessment increases as the interval between assessments increases. It is recommended that such evaluations occur on some example stocks in each region.

Stocks that are expected to have high natural fluctuations not only need frequent updating, they also need suitable data to use in this updating. For short-lived species, this means an indicator of changes in stock abundance must be very quickly (months) turned into management advice on catch limits for the upcoming fishery season. This is a major rationale for the exemption from ACLs for stocks with one-year life spans; otherwise the ACL would always be out of date relative to the current fluctuation in actual stock abundance. For medium lifespan species, this generally means

that size and/or age data needed for estimation of incoming recruitment will need to be collected and processed quickly to enable a quick turnaround from data collection to management action.

Factors Affecting Target Assessment Frequency

A pragmatic starting point is to use the mean age of fish in the catch as the target interval between assessments. Alternatively, one could use a formula based on total mortality (Z) or natural mortality (M) as roughly equivalent (Fig. 6). If all fish are recruited at age 1, then mean age in the catch is closely approximated by 0.5+(1/Z), or by 0.5+(1/(2*M)). It may be necessary to multiply this mean age by a scaling factor to achieve a good overall level of assessment frequency, and to average mean age data over several years to remove the effect of variable recruitment. The value of this scaling factor will be set after enough of the data elements are collected to do a preliminary application of the target setting process. Then decrease this interval by a specific amount for stocks with high levels of recruitment variability, or increase by a specified amount for stocks with low variability. A nonlinear scale or a cap may be needed so that very long-lived stocks are not assigned an unreasonably long assessment interval. Evaluation and refinement of this approach and consideration of additional biological factors must wait for collation of life history information for more stocks.

Fishery importance and ecosystem importance should affect the target frequency of assessments because of the improved fishing opportunity obtained by quickly tracking upturns in stock abundance, and conversely the fishery and ecosystem risk avoided by preventing acceleration of downturns.

Arguably, stock status could influence the target frequency because stocks that are known to be approaching an overfished or overfishing condition need to be watched more closely to enable ACL adjustments to avoid crossing into overfishing or overfished conditions. Because stocks that are approaching overfishing or overfished status will also tend to be stocks that have high fishery importance, and because a stock's status is constantly changing, it seems preferable to use fishery importance in setting the target assessment frequency and then use stock status in the prioritization step as a tie-breaker among stocks that are equally due for assessment. While stocks that are on rebuilding plans, or approaching an overfishing or overfished condition need somewhat more frequent updates because these conditions are indications of changing stock abundance or fishing mortality rates, the prioritization system should ward against excessive diversion of assessment efforts from healthy stocks that are supporting major fisheries. Doing so will weaken tracking of these stocks and hinder close tracking of their available yield. The proposed system will prevent this diversion because the years overdue will be a primary factor in setting assessment priorities.

Target Assessment Frequency

1. **Mean Age of Fish in Catch * Scaling Factor**
2. **Adjust for recruitment variability:**
   a. **-1 year(e.g. more frequent) for stocks with high recruitment variability;**
   b. **+ 1 year for stocks with low recruitment variabilityvariability**
3. **Adjust for fishery value:**
   a. **– 1 year for stocks with commercial or recreational score above a level to be specified**
   b. **+ 1 year for stocks with commercial and recreational score below a level to be specified**
4. **Adjust for ecosystem importance similarly to fishery value**

EXAMPLE:

1. **Mean age in catch is 4.5 years and scaling factor is 1.0;**
2. **Recruitment variability is high (so subtract 1 year);**
3. **Fishery value is high for commercial but low for recreational (so subtract 1 year);**
4. **Ecosystem importance is moderate (so no change to target);**
5. **Target Assessment Frequency = 4.5*1.0 -1 -1 +0 = 2.5 years**
6. **Round down to 2 years.**

SETTING PRIORITIES FOR ASSESSMENTS

The priority for updating an assessment starts with the number of years that it is overdue relative to its target update frequency, but allows for new data availability, fishery importance and stock status to adjust this priority.

Once a target frequency for assessment updates has been established, the goal is to keep as close to this schedule as possible given available resources. Conducting assessments more frequently is an inefficient use of assessment expertise and burdens the regulatory system with too frequent and unnecessary changes. Waiting too long to conduct an update means that management is based upon increasingly stale information. With each passing year, there is a greater chance that

the stock has drifted off the previous forecast and the fishery is being overly or insufficiently restricted.

After accounting for the years overdue, then additional factors of stock status, new information, and fishery importance are added as fractional values in order to keep them from overly influencing the prioritization. First, stock status (which has values of 1 to 9) is divided by 10 and added to the number of years overdue. This means that stocks on rebuilding plans, or stocks approaching an overfished or overfishing condition, will have priority over stocks that are equally due/overdue but have a less at-risk status. However, at-risk stocks that are not yet due relative to their target frequency will not leapfrog ahead of stocks that are overdue for assessment. This approach will provide a balanced portfolio that will address the most overdue assessments, then the stocks with more at-risk status, and then the less at-risk stocks that are at their target frequency of updating.

When the target interval between assessment updates is several years, then it may be possible to make a quick evaluation of new information as it becomes available and adjust the stock's priority for assessment up or down based upon how closely the new data match expectations from forecasts from the previous assessment. Note that adjustments of this sort are disruptive to an organized planning process and should be applied cautiously. Even making these quick evaluations involves data preparation, staff analysis, and report writing that will detract from the program's capability to conduct planned assessments. A score of up to 1.0 is allowed for this factor.

Fishery importance has already been taken into account when setting the target assessment frequency. However, it is reasonable to use fishery importance as a small factor when other factors are equitable. This is accomplished by adding the fishery value score divided by 10.

Assessment uncertainty is not included as a quantitative factor. For example, some assessments have high uncertainty because the time series of data is short. For these assessments, more frequent updates in the short-term could improve the assessment because data are accumulating rapidly. On the other hand, some assessments have high uncertainty because the data are inherently noisy or there are unknown factors causing fluctuations or retrospective patterns in the assessment. In such cases, it seems better to not shorten the time between assessments and instead to put the effort into better understanding of the factors causing the uncertainty. Consequently, past assessment uncertainty is only used as a factor if there are new information or research results available that are expected to resolve some of that uncertainty. Simply re-doing an assessment because the past assessment had uncertainty is undesirable because that assessment effort could more productively be directed to other stocks.

Prioritizing Assessments Updates

1. **Years overdue relative to target frequency;**
2. **Add stock status score divided by 10;**
3. **Add up to 1.0 if there is new information that indicates a chance from the past assessment;**
4. **Add fishery importance divided by 10;**

EXAMPLE:

1. **Assessment is 2 years past its target date for updating;**
2. **Stock status score is 6;**
3. **There is no new information that indicates an obvious change**
4. **Commercial value score is 3.5 and recreational score is 1.4 and no additional fishery importance factors;**
5. **Priority score = 2.0 + 6.0/10 + 0.0 + (3.5+1.4)/10 = 3.09**

Benchmark vs. Update Assessment

The history of recent assessments is primarily a factor in deciding between doing another update, or doing a full benchmark assessment[3]. The staff time and review effort needed to conduct a benchmark assessment is substantially greater than that needed to provide an update, so decisions to do full benchmarks should carefully consider the forgone opportunity to do updates for several stocks instead of the benchmark. There are three issues that contribute to a decision to do the benchmark assessment:

1. A new data type or research finding is available. A benchmark assessment is needed to fully investigate the assessment performance with this new information, especially if it would lead to elevating the level of the assessment.
2. The previous assessment identified a shortcoming that is not feasible to investigate with available methods and data. Simply re-doing a benchmark should be avoided unless there is good reason to expect more certainty to come from the new benchmark.
3. Several updates have been conducted and a refresh of selected aspects of the assessment is reasonable, although not specifically identified by either issue 1 or 2 above.

[3] An update assessment uses a previously reviewed modeling approach and data types and simply updates the assessment using the most recent data. Only minimal review is needed. A benchmark assessment introduces new methods or data types and may involve a thorough investigation of all aspects of the assessment. A fuller review commensurate with the degree of innovation and controversy is warranted.

Benchmarks should not be done if none of the three criteria are met, irrespective of the age of the assessment. Most of a region's assessments need to be conducted as simple updates if a high pace of assessments is to be accomplished, as in the North Pacific. The fact that a stock has high importance or a low status should not be a primary driver for doing full benchmark assessments. These factors have already contributed to setting target assessment frequency and prioritizing stocks relative to this update frequency. When benchmark assessments are done without having fundamentally new information to consider, the assessment generally treads over the same issues that were unresolved in the earlier assessment.

CHALLENGES

This proposed prioritization system is a first attempt at a comprehensive approach. It will need adjustments as it begins to be applied. Nevertheless, the compilation and presentation of information described in this document can immediately improve the basis on which priorities are set.

One challenge will be to ward against a lopsided application of the system. The goal is somewhere in between a situation in which all stocks are perceived to need equally good assessments, and a situation in which only the most important stocks get assessed. All stocks need some level of baseline assessment and the most important and vulnerable stocks need better assessments. The proposed system is designed to help achieve such a balance, but adjustments may be needed after a few years of implementation.

The degree to which this prioritization system addresses the need for inclusion of ecosystem factors is preliminary, at best. The focus has been upon getting basic assessments done. Ongoing work on an update of the Stock Assessment Improvement Plan should provide additional guidance on how to determine which stocks are most in need of a broader ecosystem consideration. All assessments should recognize that every fish stock exists within a regional ecosystem and the effect of ecosystem changes on the stock should always be considered to the extent feasible.

Many aspects of this prioritization approach are somewhat ad hoc. The ICES investigation of factors affecting assessment frequency clearly indicated that only through a management strategy evaluation can one ascertain the expected improved performance from better data and shorter time lags. This same situation is true for assessments and fishery management in the U.S.

Application of this prioritization system will not get more assessments done each year. The goal is to be more objective about which assessments get done. It is likely that many stocks will be identified as needing better assessments than present data allow, and many stocks for which more frequent assessments are needed. These gaps can identify needs, but filling these needs will require an expanded assessment program. Alternatively, the system could be used to determine what target level of assessment frequency is achievable given current assessment capacity.

The complete science-management system has more elements than the assessments themselves. There are potential bottlenecks associated with timing of peer reviews, time needed to develop management responses to updated assessments, alignment of assessments with start dates

of fishing years, etc. These additional steps in the overall process also warrant consideration as overall improvements in throughput are sought.

IMPLEMENTATION PLAN

- Distribute draft to Fishery Management Councils, NMFS Regional Offices, Fishery Commissions for comment – February 2014;
- Create database of needed information as an added table in the Species Information System – spring 2014;
- Each region begins work on comprehensive Productivity-Susceptibility Analysis and Only Reliable Catch Analysis to serve as baseline for determining which stocks need assessments – begin spring 2014;
- Test prioritization system to determine if adjustments to scaling factors are needed to achieve reasonable results – summer 2014;
- Make database available to regional coordinating committees charged with setting priorities for regional assessments – fall 2014; Create access through SIS public portal;
- Commission Management Strategy Evaluations to test the expected performance of this prioritization system over time – 2015;
- Explore Decision Support System facilitators to guide regional coordinating committees through application of the prioritization process – 2016.

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TABLES

Table 1. This table presents the distribution of FSSI and non-FSSI stocks among Councils and Science Centers in 2014. Each row in this table represents a category within which prioritization could occur, with exceptions in the note below.

Council	Centers	Non-FSSI	FSSI	All
CFMC	SE	37	8	45
Atl_HMS	SE	6	21	27
GMFMC	SE	15	23	38
SAFMC	SE	21	22	43
NEFMC	NE	2	37	39
MAFMC	NE	0	11	11
NPFMC	AK	30	35	65
PFMC	NW-SW	17	45	62
PFMC_salmon	NW-SW	67	0	67
Pac_HMS	SW-PI	14	18	32
WPFMC	PI	42	7	49
		251	227	478

Note: HMS refers to Highly Migratory Species. Stocks that are shared between the GMFMC and SAFMC would be covered by the GMFMC unless otherwise arranged by the SEDAR (Southeast Data and Assessment Review) committee. The MAFMC and NEFMC could be covered by the same prioritization process, as occurs now with the Northeast Regional Coordinating Committee.

Table 2. Summary of factors considered.

FACTOR	First-time assessments	Target assessment level	Target Assessment frequency	Priority for assessment	Priority for benchmark
Fishery importance	Yes	Yes	Yes	Yes	
Ecosystem importance	Yes	Yes	Yes		
Stock status	Yes, from ORCS & PSA			Yes	
Stock biology		Yes	Primary		
Assessment history; Due or overdue?				Primary	
New data indicates drift from forecast				Yes	
New data can raise level or resolve uncertainty					Yes

Table 3. This table shows the ranking of stocks with the largest commercial and recreational catch levels in 2009. Note that values are whole weight, not meat weight, so quahog and clam are higher than one would expect.

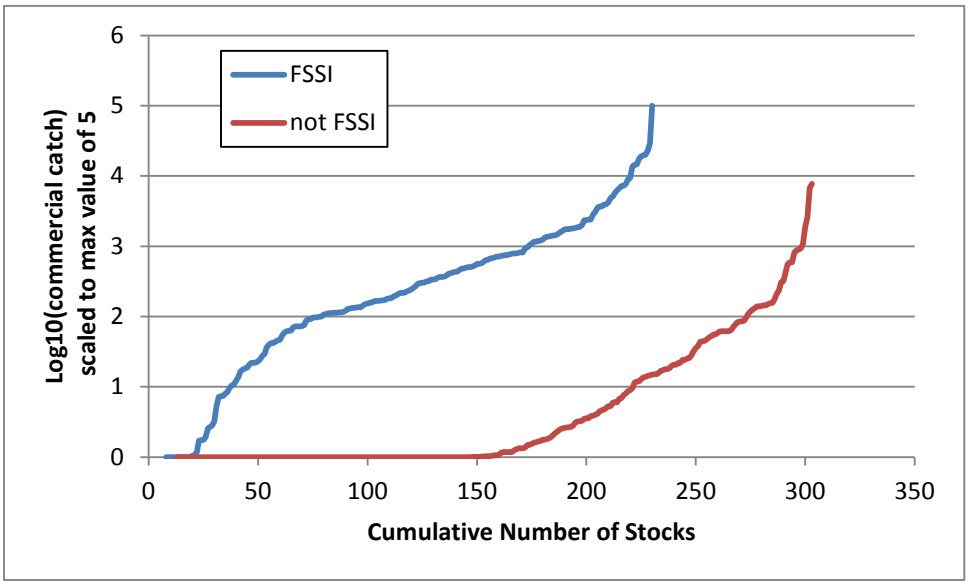
Top 20 Commercial Catch	Top 20 Recreational Catch	High Recr and Comm
Walleye pollock - Eastern Bering Sea	Bluefish - Atlantic Coast	Atlantic mackerel - Gulf of Maine / Cape Hatteras
Pacific cod - Bering Sea / Aleutian Islands	Yellowfin tuna - Central Western Pacific	Pollock - Gulf of Maine / Georges Bank
Ocean quahog - Atlantic Coast	Summer flounder - Mid-Atlantic Coast	Scup - Atlantic Coast
Yellowfin sole - Bering Sea / Aleutian Islands	Red snapper - Gulf of Mexico	Pacific chub mackerel - Pacific Coast
Atlantic surfclam - Mid-Atlantic Coast	King mackerel - Southern Atlantic Coast	Summer flounder - Mid-Atlantic Coast
Atlantic herring - Northwestern Atlantic Coast	Scup - Atlantic Coast	Dolphinfish - Southern Atlantic Coast / Gulf of Mexico
Opalescent inshore squid - Pacific Coast	Gag - Gulf of Mexico	Red grouper - Gulf of Mexico
Atka mackerel - Bering Sea / Aleutian Islands	Black sea bass - Mid-Atlantic Coast	Bluefish - Atlantic Coast
Pacific hake - Pacific Coast	King mackerel - Gulf of Mexico	Caribbean spiny lobster - Southern Atlantic Coast / Gulf of Mexico
Pacific sardine - Pacific Coast	Skipjack tuna - Central Western Pacific	Spanish mackerel - Southern Atlantic Coast
Walleye pollock - Gulf of Alaska	Spanish mackerel - Southern Atlantic Coast	Vermilion snapper - Gulf of Mexico
Pacific cod - Gulf of Alaska	Dolphinfish – Pacific	Yellowfin tuna - Central Western Pacific
Brown rock shrimp - Gulf of Mexico	Spanish mackerel - Gulf of Mexico	King mackerel - Southern Atlantic Coast
Brown shrimp - Gulf of Mexico	Little tunny - Gulf of Mexico	King mackerel - Gulf of Mexico
Bering Sea / Aleutian Is. Arrowtooth Flounder	Gray snapper - Gulf of Mexico	Red hake - Southern Georges Bank / Mid-Atlantic
White shrimp - Gulf of Mexico	Red grouper - Gulf of Mexico	Atlantic Large Coastal Shark Complex
Bering Sea / Aleutian Islands Other Species	Atlantic mackerel – Gulf Maine / Cape Hatteras	Red snapper - Gulf of Mexico
Sea scallop - Northwestern Atlantic Coast	Greater amberjack - Gulf of Mexico	Atlantic Small Coastal Shark Complex
Arrowtooth flounder - Gulf of Alaska	Cobia - Gulf of Mexico	Yellowtail snapper - Southern Atlantic Coast / Gulf of Mexico
Atlantic mackerel - Gulf of Maine / Cape Hatteras	Greater amberjack - Southern Atlantic Coast	

Table 4. Table of attributes for assigning stock status for historical catch-only assessments (from Berson et al 2011).

Overall scores are obtained by an unweighted average of the attributes for which scoring is possible, although alternative weighting schemes could also be considered. An initial assignment to a stock status category is: mean scores>2.5—heavily exploited; stocks with mean scores 1.5-2.5--moderately exploited; and stocks with mean scores<1.5--lightly exploited. When the attribute does not apply or is unknown it can be left unscored.

Attribute	Stock status		
	Lightly exploited (1)	**Moderately exploited (2)**	**Heavily exploited (3)**
Overall fishery exploitation based on assessed stocks	All known stocks are either moderately or lightly exploited. No overfished stocks	Most stocks are moderately exploited. No more than a few overfished stocks	Many stocks are overfished
Presence of natural or managed refugia	Less than 50% of habitat is accessible to fishing	50%-75% of habitat is accessible to fishing	>75% of habitat is accessible to fishing
Schooling, aggregation, or other behavior responses affecting capture	Low susceptibility to capture (specific behaviors depend on gear type)	Average susceptibility to capture (specific behaviors depend on gear type)	High susceptibility to capture (specific behaviors depend on gear type)
Morphological characteristics affecting capture	Low susceptibility to capture (specific characteristics depend on gear type)	Average susceptibility to capture (specific characteristics depend on gear type)	High susceptibility to capture (specific characteristics depend on gear type)
Bycatch or actively targeted by the fishery	No targeted fishery	Occasionally targeted, but occurs in a mix with other species in catches	Actively targeted
Natural mortality compared to dominant species in the fishery	Natural mortality higher or approximately equal to dominant species ($M \geq M$)	Natural mortality equal to dominant species ($M \approx M$)	Natural mortality less than dominant species ($M < M$)
Rarity	Sporadic occurrence in catch	Not uncommon, mostly pure catches are possible with targeting	Frequent occurrence in catch
Value or desirability	Low value (< $1.00/lb, often not retained (< 33% of the time)	Moderate value ($1.00 - $2.25), usually retained (34-66% of the time)	Very valuable or desirable (e.g., > $2.25/lb), almost always retained (>66% of the time).
Trend in catches (use only when effort is stable)	Catch trend increasing or stable (assign score of 1.5)	Catch trend increasing or stable (assign score of 1.5)	Decreasing catches

FIGURES



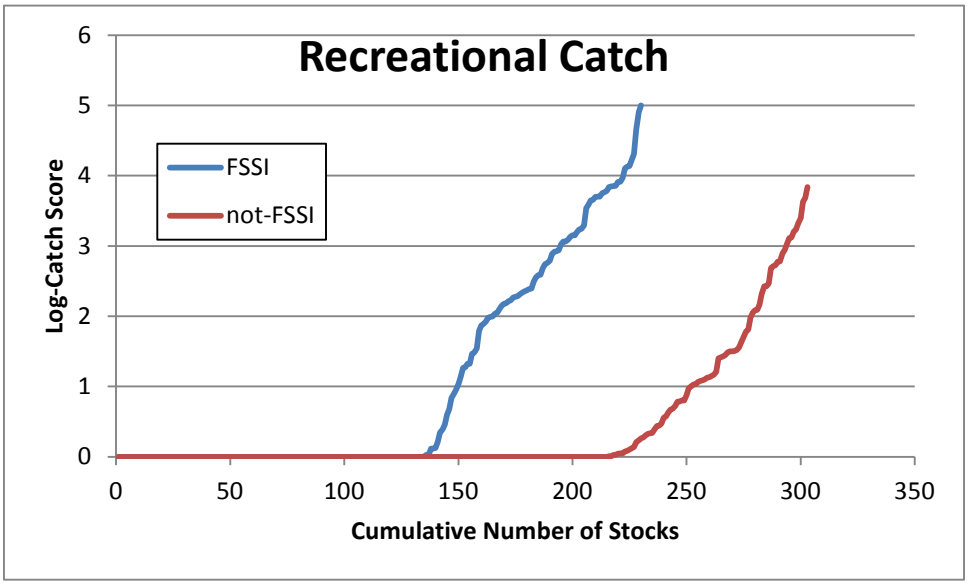
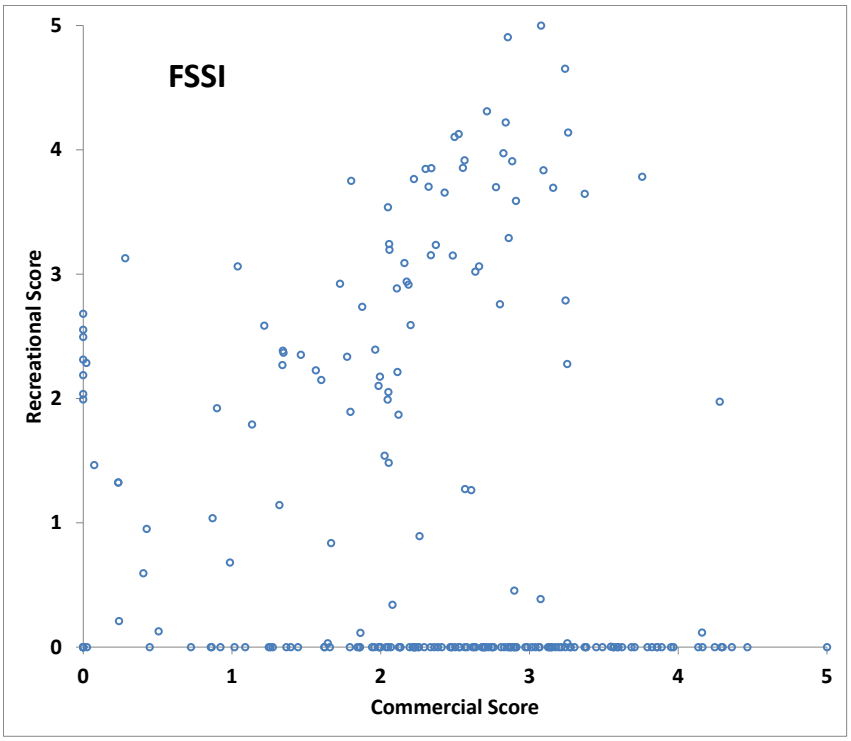


Figure 1. Ranking of stocks according to the amount of catch. Each stock's score is calculated as the log10(1.0+catch (in thousands of pounds)). (a) commercial catch results are shown at the top and (b) recreational catch is shown at the bottom. Results are shown separately for the 230 stocks included in the Fish Stock Sustainability Index (FSSI) and for the other stocks in Fishery Management Plans. For each plot, the stocks are re-ordered according to their catch.



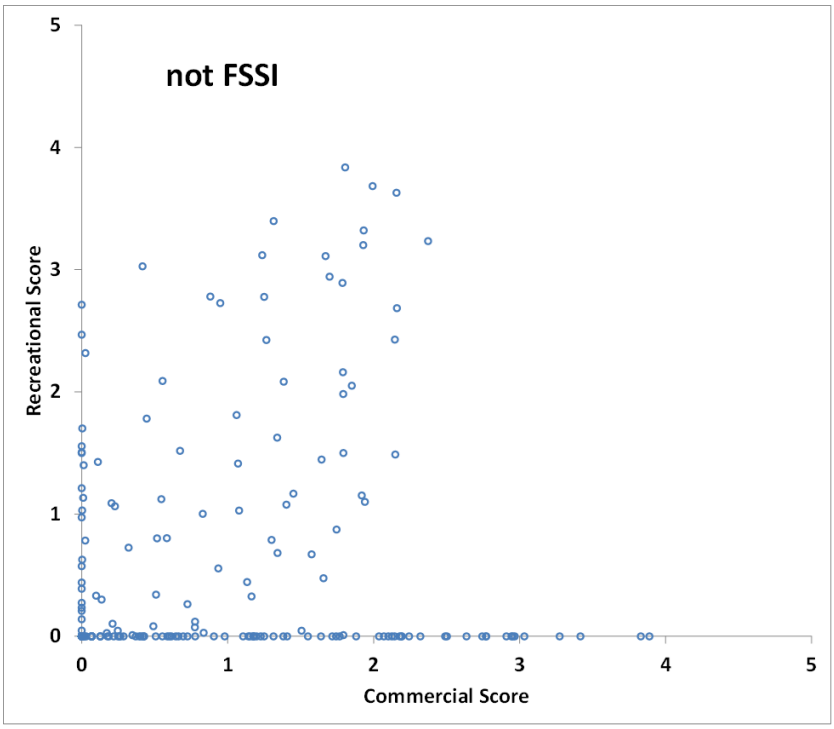


Figure 2. Preliminary relationship between commercial score and recreational score for FSSI stocks and non-FSSI stocks..

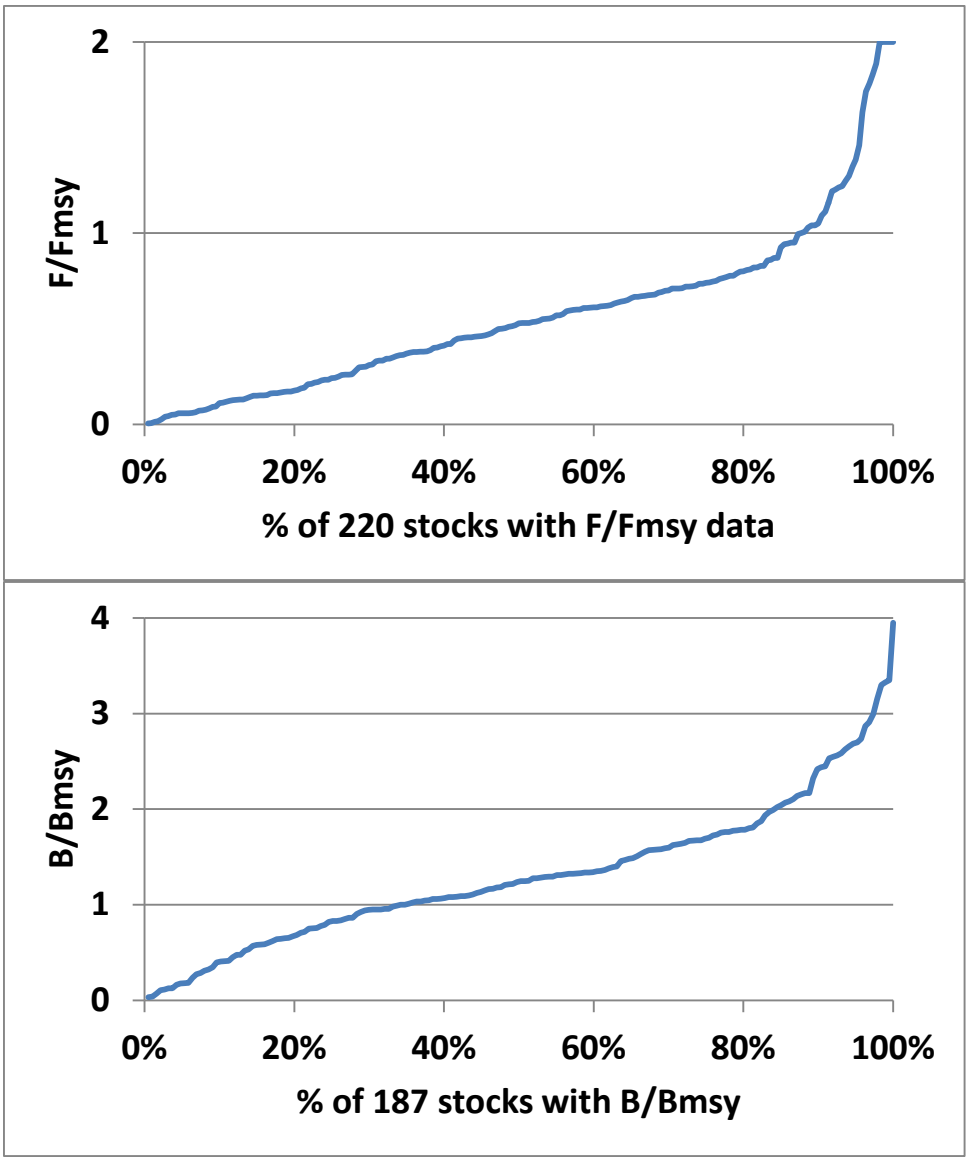


Figure 3. Cumulative distribution of the ratio of F to Fmsy in the most recent assessment of 220 stocks (upper panel), and cumulative distribution of B to Bmsy for 187 stocks in the lower panel

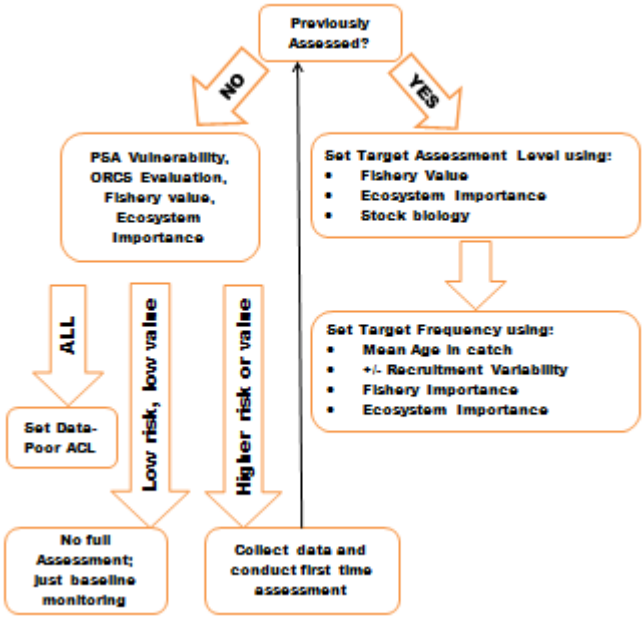


Figure 4. Flowchart showing steps in the setting of assessment target levels and assessment frequencies.

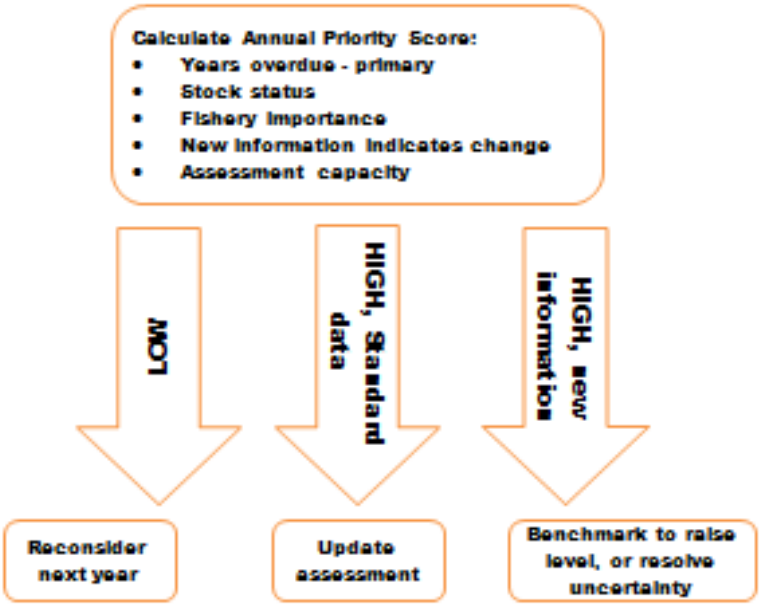


Figure 5. Flowchart showing steps in the setting of annual assessment priorities.

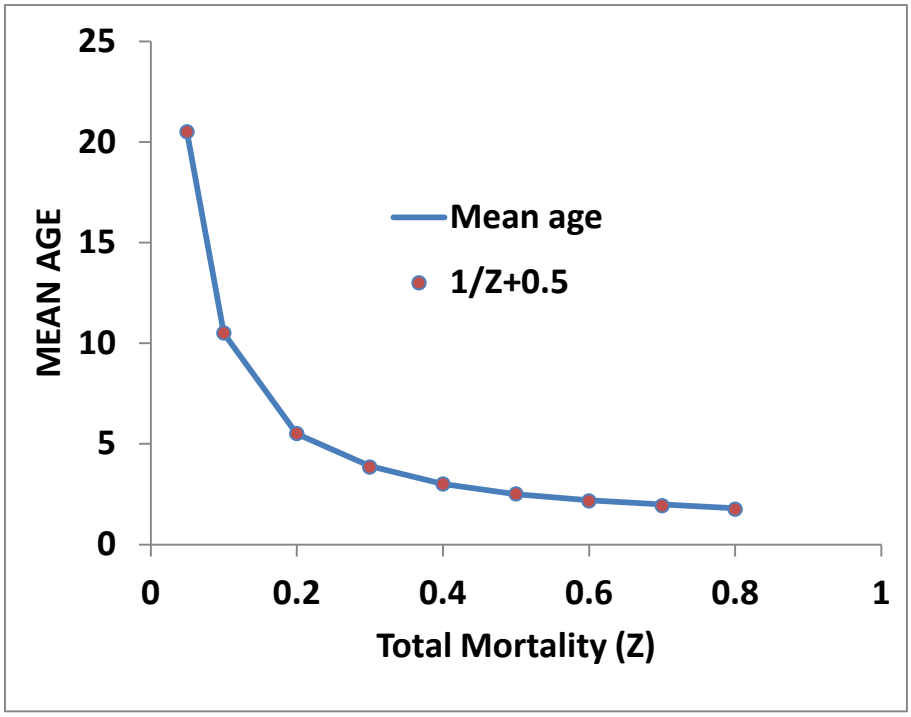


Figure 6. Relationship between total mortality rate (Z) and the expected mean age of fish in the stock.

Implementing an Assessment Prioritization Process

Briefing for
Northeast Regional Coordinating Committee
Hanover, MD
Apr 29, 2014

Why Prioritize?

- Some stocks need very good and timely assessments, but no assessment will ever provide perfect information, real-time
- All managed stocks need some level of assessment, but costs could exceed benefits for some low-valued stocks
- The goal is a prioritized portfolio of right-sized assessments for each stock
- Achieved through facilitation and standardization of each regional prioritization process
- Nationally, gaps in capability will be more apparent and can be considered for future investments

Assessment Goal

- Assessment goal is to provide scientific information needed to prevent overfishing (through forecast of annual catch limits), rebuild overfished stocks and achieve optimum yield
- How good does each stock's assessment need to be to achieve this goal?
- How frequently must it be updated?
- These stock-specific assessment goals allow us to quantify priorities among stocks

Assessment Prioritization History

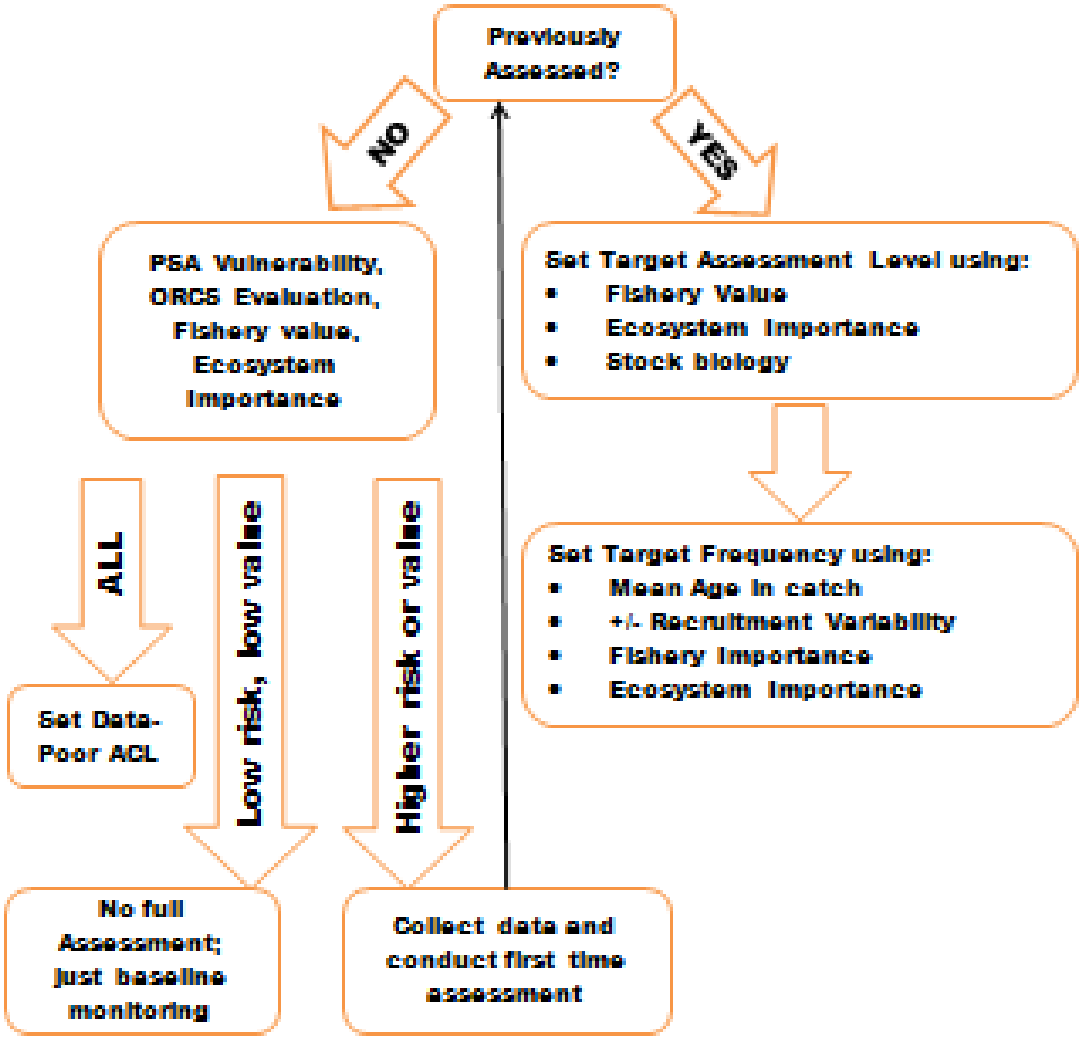
- Currently, stock assessment scheduling is region-specific under a national umbrella. Each region has a process (e.g. NRCC) involving the local NMFS Science Center, Fishery Management Council and Commission;
- OMB requested that NMFS develop a prioritization system for fish stock assessments
- Some regions, particularly NE and SE, have worked on assessment scheduling and prioritization in recent years
- A NMFS working group was formed in 2011 to develop a prioritization system
- In 2013, call for prioritization appeared in Congressionally requested GAO review of stock assessments, and in an introduced bill on improved science for MSA

Data Needed for Prioritization

- Commercial Fishery Importance
- Recreational Fishery Importance
- Ecosystem Importance
- Stock biology (principally: natural mortality rate and recruitment variability)
- Stock Status info from previous assessments
- Assessment history, unresolved uncertainties

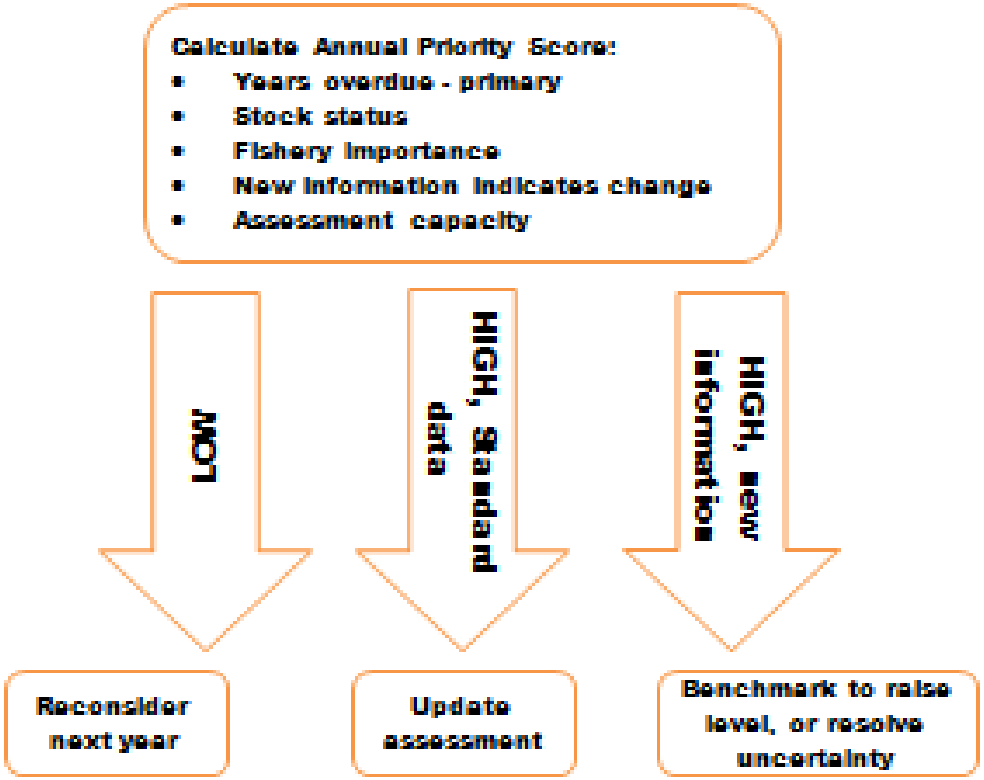
Prioritization Set-Up

- Among stocks that never have been assessed:
  - *Identify those OK with baseline monitoring, and*
  - *Those needing priority for first-time assessment*
- Among previously assessed stocks, set medium-term assessment goals
  - *target assessment level for each stock; this drives the data requirements*
  - *Set target assessment update frequency for each stock*



Setting Priorities

- Annually update priorities for conducting assessments (includes traffic light)
- Pass on stocks with low score
- Update assessments for stocks that are at or exceed their target update period
- Benchmark assessments for stocks for which new data or methods will allow resolving uncertainties or advancing to higher level



Prioritization Outcome

- The whole portfolio of assessment needs will be transparent to all participants in assessment process;
- Important assessments will get done when they need to get done, not sooner and not a lot later;
- This “right-sizing” of the assessment frequency for important tocks may help release some assessment effort for currently under-assessed stocks.

Implementation Steps

1. Distribute draft to Fishery Management Councils, NMFS Regional Offices, Fishery Commissions and to public via website – February 2014;
2. Create database of needed information as an added table in the Species Information System – begin winter 2014;
3. Receive comments from Council by May 1, 2014 and summarize to the May CCC;
4. Each region begins work on comprehensive Productivity-Susceptibility Analysis and Only Reliable Catch Analysis to serve as baseline for determining which stocks need assessments – begin spring 2014;
5. Test prioritization system to determine if adjustments to scaling factors are needed to achieve reasonable results – summer 2014;
6. Make database available to regional coordinating committees charged with setting priorities for regional assessments – fall 2014; Create access through SIS public portal;
7. Commission Management Strategy Evaluations to test the expected performance of this prioritization system over time – 2015;
8. Explore Decision Support System facilitators to guide regional coordinating committees through application of the prioritization process – 2016.

Challenges for Prioritization

1. Workload in getting initial information generated and organized;
2. Unsure that system will result in good balance of baseline monitoring for all and highest quality assessments for some;
3. Does not address prioritization of surveys and expanded scope to include ecosystem considerations;
4. May not get more assessments done, but can help identify needs;
5. Some constituents may be expecting a between region prioritization, rather than a national facilitation of within region prioritization;
6. Review processes and fishery management systems may also need tweaking to take best advantage of prioritized assessments.

BACKUP SLIDES

Why do we Assess Fish Stocks and Monitor Fisheries?

- Assessments provide a measure of how much can be caught, while monitoring determines how much has been caught
- Lack of good assessments creates high uncertainty, which can lead to either inadvertent overfishing or decreased yield due to large buffers
- Updated assessment are necessary for identifying when changes in fish stocks occur (due to ecosystem, environmental, or fishery factors)

Assessments Calculate:

- Long-term stock productivity and sustainable harvest rate
- Current stock abundance
- Current harvest rate
- Forecast of future stock abundance and available yield (OFL)
- Indicators of changes in ecosystem productivity

Stock Assessment Process

CATCH

Retained and discarded catch from commercial and recreational fisheries

Age and size of caught fish

ABUNDANCE

Time series of standardized index of stock abundance from NOAA vessels and charter vessels

Includes age and size data, and associated ecosystem observations where possible

BIOLOGY

Age, growth, maturity, natural mortality, movement

POPULATION MODEL

Calibrated from data inputs
Estimates time series of fish abundance and fishing mortality

STATUS OF STOCK

Overfished?
Overfishing occurring?

ANNUAL CATCH LIMIT

Forecast catch level that implements harvest policy

Linking Investments to Assessments

- Each stock's assessment uses data from many sources, as just shown
- Most data sources simultaneously provide data for many species
- This many-to-many relationship confounds accounting the cost per assessment
- Investments build regional assessment capacity, not individual assessment updates

Recent Assessment Frequency

	ASSESSMENT AGE															
	0	1	2	3	4	5	6	7	8	10	11	12	15	17	none	All
Alaska	31														4	35
Cal. Current	5	9		4	1	6		7						1	12	45
Caribbean															8	8
Gulf of Mexico	6	5	1	1	2							1			7	23
International - Atl	2	2	4													8
International - Pac	5	5		1	1										6	18
Northeast	18	2	6	2											20	48
Pacific Islands	2	1													4	7
Southeast	6	4	3	2	6		1		1	1	1		1		12	38
Grand Total	75	28	14	10	10	6	1	7	1	1	1	1	1	1	73	230

As of April 2012; Includes assessments at level 3 or higher

"none" includes some assessments done at lower levels

Scheduling Worksheet for Stock Assessments. **date: Dec. 30, 2013**

Basis for entries in Table: November 2013 NRCC meeting +after

2013: 1st half	**2013: 2nd half**
White hake - SARC 56, Feb 19 -22, 2013	Striped bass - SARC 57, [July 23-26]
Atlantic surfclam - SARC 56	Summer flounder - SARC 57
(River herring - Extinction Risk Analysis)	(Data Review, August 5-9)
(EGB cod benchmark - Ap. 9-11, 2013, TRAC)	
(TRAC - EGB cod, EGB haddock, GB YT - June 25-27 Canada)	
(Updates: Bluef, Scup [w/ SSC], Dog, skates, monkfish -Ap. 8-9 Op. Assess., Ocean quahog, Mackerel, butterfish, tilefish, squid	

2014: 1st half	**2014: 2nd half**
N. shrimp - SARC 58, Jan. 27-31	Scallops - SARC 59, July 15-18
Tilefish - SARC 58	GOM haddock - SARC 59
Butterfish - SARC 58	
(GB YT Alternative - March)	(Pollock, GOM winter fl, GB winter fl, updates, Aug, *SSC Review*)
(Model Review - May 19-23)	(ASMFC - Lobster peer review -Nov)
(TRAC - EGB cod, EGB haddock, GB YT) June 23 -27, WH	
(Updates: Bluefish, BlkSeaBass [data update; research report], Scup [rumble], Fluke [rumble strip], Mackerel [data update, research plan]), squids [data update])	(Updates: Dog [rumble], skates, hakes [silver, red, offshore])

2015: 1st half	**2015: 2nd half**
Scup - SARC 60, Date: TBD	Pollock - SARC 61, *Nov - Dec.*
Bluefish - SARC 60	Ocean quahog BRPs - SARC 61
(ASMFC - Sturgeon -Feb).	
(16 Groundfish Stocks, Operational Assessment, Date TBD)	*(Research on Rapid Assessment Methods, rumble strips, sign posts) ???*
(TRAC - EGB cod, EGB haddock, GB YT - June)	
(Updates: BlkSeaBass [data update],Fluke, surfclam [product ???], Dog, skates, Mackerel, butterfish, tilefish [data update])	

2016: 1st half	**2016: 2nd half**

Key:

Italics = Under consideration, but not officially scheduled.

"( )" = not in the SARC process.

Cells filled with gray = work completed.

Scheduling Worksheet for Stock Assessments. **date: Apr. 17, 2014**

Basis for entries in Table: November 2013 NRCC meeting +after

2013: 1st half	**2013: 2nd half**
White hake - SARC 56, Feb 19 -22, 2013	Striped bass - SARC 57, [July 23-26]
Atlantic surfclam - SARC 56	Summer flounder - SARC 57
(River herring - Extinction Risk Analysis)	(Data Review, August 5-9)
(EGB cod benchmark - Ap. 9-11, 2013, TRAC)	
(TRAC - EGB cod, EGB haddock, GB YT - June 25-27 Canada)	
(Updates: Bluef, Scup [w/ SSC], Dog, skates, monkfish -Ap. 8-9 Op. Assess., Ocean quahog, Mackerel, butterfish, tilefish, squid	

2014: 1st half	**2014: 2nd half**
N. shrimp - SARC 58, Jan. 27-31	Scallops - SARC 59, July 15-18
Tilefish - SARC 58	GOM haddock - SARC 59
Butterfish - SARC 58	
(GB YT Alternative - April 14-19, WH)	(Pollock, GOM winter fl, GB winter fl, updates, first half of Aug, Oper. Assess.)
(Model Review - May 19-23)	(ASMFC - Lobster peer review -Nov --> 2015??)
(TRAC - EGB cod, EGB haddock, GB YT) June 23 -27, WH	
(Updates: Bluefish, BlkSeaBass [data update; research report], Scup [rumble], Fluke [rumble strip], Mackerel [data update, research plan]), squids [data update])	(Updates: Dog [rumble], skates, hakes [silver, red, offshore])

2015: 1st half	**2015: 2nd half**
	Scup - SARC 60, Date: July 14-17
(ASMFC - Sturgeon -Feb).	*Bluefish - SARC 60*
Scallop Survey Methods- March 17-19, WH	
Herring, Operational Assessment, Date TBD)	
	(20 Groundfish Stocks, Operational Assessment, Oct.)
(TRAC - EGB cod, EGB haddock, GB YT - June)	
Protected species: Program Review - DATE TBD	
(Updates: BlkSeaBass [data update],Fluke, surfclam [product ???], Dog, skates, Mackerel, butterfish, tilefish [data update])	

2016: 1st half	**2016: 2nd half**
Skates - SARC 61, Month TBD	*Mackerel, Black sea bass, monkfish (SARC 62, Nov./Dec.; pick 2; choice dependent on research progress)*
Ocean quahog BRPs - SARC 61	
Ecosystem Applications, Management, Habitat : Program Review - DATE TBD	
(Updates: BlkSeaBass [data update],Fluke, surfclam [product ???], Dog, skates, Mackerel, butterfish, tilefish [data update])	

Key:

Italics = Under consideration, but not officially scheduled.

"( )" = not in the SARC process.

Cells filled with gray = work completed.

Black Sea Bass Research Track Assessment

Draft Work Plan (3/7/14)

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

Stock Assessment Workshop (SAW) Working Group Participation and Function

A Report to the Northeast Region Coordinating Council (NRCC)

Prepared by NRCC subcommittee on Action Item#2 from Spring 2013:

Deirdre Boelke
Pat Campfield
Jessica Coakley
Fred Serchuk
Jim Weinberg (lead)

Aug. 29, 2013

Table of Contents

1. Background/Rationale

Stock Assessment Workshop (SAW) Working Groups (WGs) prepare benchmark stock assessments which are peer reviewed by the Stock Assessment Review Committee (SARC) and are then published. In the future WGs may also take part in developing new assessments and methods as part of the planned "Research Track". These stock assessments form the scientific basis for managing fish and invertebrate marine resources in the Northeast Region. WGs play a key role in the stock assessment process, but there are few written guidelines which describe how WGs are formed, their composition, and how they function. This was discussed in 2009 at NRCC meetings, but the discussion did not result in any formal written guidelines for WGs. The topic was raised again in 2013, when it became evident that the SAW/SARC process would benefit from having written guidelines about SAW WG participation and function. This was formalized into an NRCC Action Item (AI) in May 2013:

NRCC AI#2

SAW Participation Working Group:

-Develop alternatives of membership and structural options

-Review the ASMFC model

-Pursue development of conflict of interest standards with GC input

Responsible parties: NEFSC (lead), MAFMC, NEFMC, and ASMFC

Due Date: Membership by June 1, 2013, recommendations due August 1, 2013

An NRCC subcommittee was formed in June 2013 to address this AI. This subcommittee report includes recommendations about the size, composition and formation of WGs. It also includes guidance on how WGs should function. In drafting this report, the subcommittee considered the ASMFC model (Draft Technical Support Group Guidance and Benchmark Stock Assessment Process, 2013) and the Guidelines for National Standard 2 of the Magnuson Stevens Act (Fed. Reg. v. 78, No. 139, July 19, 2013), and incorporated some recommendations and approaches in those documents. In the section on eligibility, this report contains recommendations for draft standards on conflict of interest. These standards have not yet been discussed with NOAA General Counsel.

2. Recommendations with Alternatives

2.1. SAW Working Group (WG) eligibility and WG formation

Effective assessment workgroups should be composed of individuals from many disciplines, possessing a broad range of skills and expertise. The development of assessment products requires a high level of expertise. SAW WG members must be constructive, efficient, and productive. The SAW WG is the group of experts required to make decisions about the stock assessment relative to addressing the assessment terms of reference (TORs). It is not intended to include every expert or researcher involved in every assessment issue.

A certain amount of debate and disagreement is normal for a SAW WG, but the group must decide by consensus, how to move forward with assessment development using the best available science. In addition, WG members should not have a significant conflict of interest that would prevent them from acting fairly, objectively, and constructively within the WG.

2.1.1. Eligibility

No Action: <u>No Criteria for SAW WG Eligibility</u>
No criteria on expertise or conflict of interest have been written for the SAW WG.

Option 1 (Preferred): <u>Eligibility (Independence, Expertise, and No Conflict of Interest)</u>

- SAW WG members should not actively participate on another committee or panel whose purpose is to peer review the products of the SAW WG. This will maintain **independence** between those who produce the stock assessment and the subsequent peer review and fishery management processes.
- SAW WG members must have **expertise** and education directly aligned with the expertise needed to address the specific assessment TORs for the stock assessment. Generally this includes experts in the following core assessment areas: Biology, Ecology/Ecosystem Science, Data and Survey Design (Fishery-Independent, Fishery-Dependent Data), Mathematics/Statistics and Modeling Methods, and Fishery Management. This includes experts involved with state, federal, or international fisheries, academics, or fisheries management entities.
- All SAW WG members will affirm to the WG Chair and SAW WG that they do not have a **conflict of interest**. They will also clearly identify all groups they represent and any terms of their employment which create or might create a conflict of interest. This can be done verbally at the first of the SAW WG meetings they attend. A conflict of interest occurs if an individual:

  -is directly employed/paid by an advocacy group to represent a certain position and/or to achieve a desired outcome for some organization regardless of the scientific results that would be derived from a fair and impartial analysis of available data. Those hired consultants who work to produce the best available science and who meet the other eligibility

requirements for independence, expertise, and no conflict of interest may be members of SAW WGs. (The process described in the Preferred Option of Section 2.1.2 will be used to make final decisions about who can be on a SAW WG.)

-is unable or incapable of coming to consensus with WG members. All WG members must be willing to strive for consensus within the WG based on the best science.

- has a direct financial stake in the outcome of the assessment.

2.1.2. Working Group Selection and Approval

No Action: <u>Ad Hoc</u>
There is no formal process for forming a SAW WG. Essentially, whoever attends the meeting is automatically on the workgroup. This could include previous workgroup members or additional persons who show up.

Option 1 (Preferred): <u>Working Group Chair and NRCC Deputies</u>
The SAW WG Chair identifies the initial workgroup membership list, after having ensured that each member on list is willing to participate. This list is passed on to the Deputies from each of the NRCC organizations (NMFS-NEFSC, NMFS-NERO, MAFMC, NEFMC, ASMFC) for final approval. Approval would not require an in-person meeting, and approval could be obtained via email or conference call. If a selected member is not approved, the SAW WG Chair would be notified. The Chair could make an alternative member recommendation (based on input from the approval body) to be considered for approval. The SAW WG Chair has the option to proceed without finding a replacement for the disapproved member.

Other considered but <u>not</u> preferred subcommittee alternatives: The group considered if just the WG Chair alone should be responsible for both selecting and approving the SAW WG, but felt the additional input from NRCC organizations would be valuable (for both NMFS internal and external chairs). The group considered if any other groups should be engaged in approval of the SAW WG. The NRCC and NEFSC Center Director were considered, but not preferred, on the basis that those entities are already extremely busy (NRCC has full agenda 2 times a year) and will likely rely on their deputies and staff for input, which could be achieved through Preferred Option 1 above. The Council Executive Committee was also considered, but not considered appropriate on the basis that that group is very large and highly political, and the approval of an assessment WG should not be a political process. In addition, the SSC was considered but probably should not play a large role in WG member approval as this may set up a conflict of interest given the SSC will ultimately review this group's work.

2.1.3. Notification of Workgroup and Meeting Participants

No Action: <u>Ad Hoc</u>
No standard process will be used to notify the SAW WG members. The SAW WG Chair or SAW Chair (from NEFSC) addresses this on an assessment by assessment basis.

Option 1 (Preferred): <u>After TORs Developed</u>
Identification of the SAW WG is completed after the assessment TORs have been developed and set. This is well in advance of the first WG meeting (e.g., generally 4-8 months on advance), and the SAW WG Chair or SAW Chair should notify all interested parties by posting the names of the SAW WG members on the SAW website or on a share drive set up for the WG, along with any meeting agendas and materials.

Other considered but not preferred subcommittee alternatives: The WG considered the use of fixed timeline (e.g., 45 days, 90 days, etc.), but this varies from assessment to assessment. TORs are generally developed 4-8 months in advance of the first assessment workgroup meeting.

2.1.4. Working Group Meeting Participants List

No Action: <u>Ad Hoc</u>
No standard process will be used to develop and maintain lists of SAW WG members or parties interested in the assessment. Presently, the WG Chair maintains an informal email list based on previous participants, and sends out emails prior to the first data meeting.

Option 1 (Preferred): <u>Improvements to NEFSC SAW Website</u>
A more enhanced section on the SAW webpage will be developed, which not only lists the schedule for data and modeling meetings (as is done presently), but details who is theWG Chair, how to be added to a email list for the workgroup (who to contact), and SAW WG membership.

Other considered but not preferred options: The WG considered shifting additional responsibilities to WG Chairs for updating contacts, but rejected this on the basis that some chairs may not be amenable to these additional responsibilities. The group also discussed possible list serve sign-ups which may be something to consider in the future, which would also place additional tasks on the WG chairs and SAW chair.

2.2 . Size of a SAW WG and selection of the WG chair

Background / Rationale
Action alternatives are presented below for SAW WG sizes up to 8 individuals. WG size will vary by stock assessment, and is dependent on the specific expertise needed to inform and develop analyses/models to complete the assessment. Typically, the following types of information and their analytical components are combined to build an assessment product: (e.g., Biology, Ecology/Ecosystem Science, Data and Survey Design (Fishery-Independent, Fishery-Dependent Data), Mathematics/Statistics and Modeling Methods, and Fishery Management.).

It is advantageous to keep WGs reasonably small to allow for consensus building and efficient development of stock assessments.

Action alternatives are presented below on who determines the WG Chair. The chair facilitates and guides assessment development discussions and strives for consensus decisions. When consensus cannot be reached, the chair is responsible for deciding whether one or multiple primary surveys, models, etc. are brought forward for review and who will present the assessment information to the SARC.

2.2.1. Working Group Size

No Action: **<u>No limits</u>**
No criteria or limits are set on the size of the SAW WG.

Option 1 (Preferred): <u>4-8 SAW WG members</u>
SAW WG size may consist of 4-8 members, comprised of the WG chair and individuals with expertise and balanced representation in each of the core assessment areas required to address the assessment terms of reference (e.g., Biology, Ecology/Ecosystem Science, Data and Survey Design (Fishery-Independent, Fishery-Dependent Data), Mathematics/Statistics and Modeling Methods, and Fishery Management.). The specific number of members within this range depends on the overall workload of the assessment and range of expertise required to complete the assessment. It is the WG chair's responsibility to determine how many members are needed to achieve sufficient expertise and balance of opinions within the group.

Option 2: <u>Small SAW WG</u>
SAW WG has a maximum of 4 members, comprised of the WG chair and individuals with expertise in the core assessment areas required to address the terms of reference (e.g., Biology, Ecology/Ecosystem Science, Data and Survey Design (Fishery-Independent, Fishery-Dependent Data), Mathematics/Statistics and Modeling Methods, and Fishery Management.)

2.2.2. Working Group Chair Selection

The WG Chair is responsible for ensuring a constructive meeting environment for all participants. The WG Chair facilitates consensus building and is responsible for ensuring consensus decisions are made regarding assessment inputs, model selection, and final workgroup products/SARC presentations. The chair does not make decisions unilaterally with regard to assessment products, but guides decisions made by the full WG. In cases where consensus cannot be reached, the WG Chair makes final determinations on WG products presented to the SARC. For instances where a minority opinion or multiple 'best models' (See Section 3) are brought to the SARC, the WG chair will present both the majority and minority opinions.

No Action: <u>NEFSC appoints Task Leaders to be WG chairs, in most cases</u>
NEFSC Population Dynamics Branch Task Leaders (e.g., southern demersal) chair SAW WGs in most cases. For contentious stocks, the Center may recommend an external chair from Council staff, academia, or other external institutions.

Option 1 (Preferred): <u>NEFSC appoints Task Leaders, in most cases, and with some input from NRCC Deputies.</u>
NEFSC Population Dynamics Branch Task Leaders (e.g., southern demersal) chair SAW WGs in most cases. For contentious stocks, the Center may recommend an external chair from Council staff, academia, or other external institutions. The NEFSC decides who the chair is, except with contentious stocks, in which case the NRCC Deputies are consulted on the final decision.

Option 2: <u>Self-Elected by WG</u>
WG chair is selected by WG itself; therefore, any WG members including the lead assessment scientist could chair the WG if elected. If this alternative is selected, then the SAW WG Chair cannot be responsible for identification of the initial SAW WG membership list (as described under Option 1 in section 2.1.2), as the workgroup will have to be formed by another entity.

Option 3: <u>NEFSC Director Selects Chair</u>
WG chair is selected by NEFSC Director. The chair may be a fisheries scientist from within or outside of the NEFSC staff, and is chosen from experts from state or Federal natural resource agencies, or from academia or international fisheries science institutions.

Option 4: <u>NEFSC Director Selects Chair followed by NRCC Review</u>
WG chair is identified by NEFSC Director, and approved by the NRCC. The chair is a fisheries scientist from within or outside of the NEFSC staff, and is chosen from experts from state or Federal natural resource agencies, or from academia or international fisheries science institutions.

3.Guidance on how SAW WGs function

3.1. WG composition and participation

WG membership requires a high level of commitment. Members must participate in all of the SAW WG meetings used to develop the assessment. To ensure efficient progress and timely delivery of the assessment, WG members cannot engage after a WG meeting and overturn WG decisions (e.g., about data set inclusion/exclusion, or model specification and selection decisions). WG's should achieve a balance of opinions and expertise in all areas relevant to the stock being assessed. An imbalance of membership may lead to over-emphasis on one area of the assessment or excessive advocacy for a certain position.

3.2. Number of WG meetings to have before the SARC Review

There is flexibility in the number of WG meetings that must be held. It depends on the complexity and importance of the benchmark stock assessment. Most SAW WGs schedule 2-3 WG meetings to evaluate data, models, BRPs, stock status, and projections. Having a special meeting with the public (see below) to discuss major issues involved with the benchmark assessment is also encouraged, if adequate time and resources are available.

3.3. Wide net for sources of data

When a WG is formed, the lead assessment scientist and the WG chair should seek to acquire all data relevant to the TORs for that stock assessment. This may include new sources of information, as well as data not collected by the NEFSC. Acquiring such data sets can be done in various ways (e.g., sending email requests, press releases, phone calls, or holding a public meeting with industry/academia to discuss the strategy for conducting the stock assessment, and any major issues related to the assessment). If relevant peer-reviewed publications exist, the WG chair and lead scientist should consider contacting the author(s) to indicate that this published information is being considered for use in the assessment.

When new data sets are obtained, the WG should review the quality of these data and determine whether the data meet scientific standards for inclusion in the assessment. If the data do not meet these standards, the WG should not include the data in the assessment and should document why the data were not included.

Research to support a stock assessment should begin after the previous benchmark assessment is completed, based on the research recommendations.

3.4. How the WG makes decisions

--Definition: **Consensus decision-making** is a group decision-making process that seeks the consent of all participants. Consensus may be defined professionally as an acceptable resolution, one that can be supported, even if not the "favorite" of each individual.

--Consensus: SAW WGs should strive to achieve consensus. This is because SARC reviewers are generally very adept at evaluating whether an analysis presented to them is technically appropriate, but they struggle with complex issues that a SAW WG was unable to resolve. The SARC generally respects the expertise and time devoted to these issues by the

SAW WG, but the SARC has limited time to resolve or delve deeply into contentious issues that may have caused dissension within a WG.

--Minority opinions: During SAW WG meetings the WG chair should seek out, but not force, a consensus of the WG on major assessment issues. If a SAW WG, which has up to 8 members, is unable to reach consensus on an assessment, a minority opinion can go forward to the SARC only if more than one WG member has the minority opinion. During the SARC peer review the SAW WG Chair, rather than a WG member, will be responsible for explaining the minority opinion and describing how it differs from the majority report.

--Documentation of WG decisions: The WG chair should keep a log of the decisions made during each day of a WG meeting. The WG Chair's daily log should describe the decision, the logic and reasons behind the decision, the number of WG members who supported the decision, and the WG members in attendance at the meeting.

3.5. Dealing with single best model or with multiple models

For any TOR in which one or more models are explored by the WG, the WG report should provide a detailed account of the "best" model, including inputs, outputs, diagnostics of model adequacy, and sensitivity analyses that evaluate the robustness of model results to assumptions. In less detail, all other models evaluated by the WG should be described and the strengths, weaknesses and results of the other models explained in relation to the "best" model.

Ideally the WG will be able to decide on and select a "best" model. However, when this is not possible, the alternative model(s) should be described in detail, and the relative utility of each model summarized, including a comparison of results. It should be highlighted whether any of the models represents a "minority" opinion (see Section 3.4) of the SAW WG.

For the "best model", include one or more tables that describe the model structure (for example: model type or name, age- or length-based, sex-based, types of landings data, length-weight parameters, maturity parameters, size bins, time bins, M, surveys used, model years for surveys and catch, etc.).

3.6. SAW WG Chair's Responsibilities

The WG Chair is responsible for chairing the SAW WG Meetings (e.g., Data, Modeling, and Biological Reference Points), assuring that assessment reports are prepared on time, and attending the SAW/SARC review as a WG representative along with the lead assessment scientist. The WG Chair is responsible for determining who makes presentations to the SARC. (Additional responsibilities are mentioned in other sections.)

3.7. Invited collaborators

The WG Chair may invite individuals to attend WG meetings who contribute research papers or who have particular expertise and present information to the WG as appropriate. These invited collaborators are not WG members, and while they may engage in a full discussion with the WG, they may not participate in WG consensus decisions.

3.8. Rules of Engagement among members of a SAW WG

Anyone participating in SAW assessment working group meetings that will be running or presenting results from an assessment model is expected to supply the source code, a compiled executable, an input file with the proposed configuration, and a detailed model description in advance of the model meeting. Source code for NOAA Toolbox programs is available on request. These measures allow transparency and a fair evaluation of differences that emerge between models.

DRAFT PAPER. NOT FINAL OR REPRESENTING FINAL AGENCY POLICY

Stock Assessment Workshop (SAW) Working Group Participation and Function

A Report to the Northeast Region Coordinating Council (NRCC)

Prepared by NRCC subcommittee on Action Item#2 from Spring 2013:

Deirdre Boelke
Pat Campfield
Jessica Coakley
Fred Serchuk
Jim Weinberg (lead)

~~Aug. 29, 2013~~ (Revised Dec. 6, 2013)

Table of Contents

1. Background/Rationale

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NRCC AI#2

SAW Participation Working Group:

-Develop alternatives of membership and structural options

-Review the ASMFC model

-Pursue development of conflict of interest standards with GC input

Responsible parties: NEFSC (lead), MAFMC, NEFMC, and ASMFC

Due Date: Membership by June 1, 2013, recommendations due August 1, 2013

An NRCC subcommittee was formed in June 2013 to address this AI. This subcommittee report includes recommendations about the size, composition and formation of WGs. It also includes guidance on how WGs should function. In drafting this report, the subcommittee considered the ASMFC model (Draft Technical Support Group Guidance and Benchmark Stock Assessment Process, 2013) and the Guidelines for National Standard 2 of the Magnuson Stevens Act (Fed. Reg. v. 78, No. 139, July 19, 2013), and incorporated some recommendations and approaches described in those documents. In the section on eligibility, this report contains recommendations for draft standards on conflict of interest. An earlier version of this report (dated August 29, 2013) was reviewed by the NRCC on November 21, 2013, and that discussion included input from a representative of NOAA General Counsel. Most of the discussion focused on Conflict of Interest. The NRCC asked the NRCC subcommittee to revise the document based on the discussion and to resubmit it to them for additional consideration. Based on the NRCC comments, the most significant revisions were made to the conflict of interest section and to the process for evaluating conflict of interest. The most recent version of this document is dated December 6, 2013.

2. Recommendations with Alternatives

2.1. SAW Working Group (WG) eligibility and WG formation

Effective assessment workgroups should be composed of individuals from many disciplines, possessing a broad range of skills and expertise. The development of assessment products requires a high level of expertise. SAW WG members must be constructive, efficient, and productive. The SAW WG is the group of experts required to make decisions about the stock assessment relative to addressing the assessment terms of reference (TORs). It is not intended to include every expert or researcher involved in every assessment issue.

A certain amount of debate and disagreement is normal for a SAW WG, but the group must decide by consensus, how to move forward with assessment development using the best available science. In addition, WG members should not have a significant conflict of interest that would prevent them from acting fairly, objectively, and constructively within the WG.

2.1.1. Eligibility

No Action: <u>No Criteria for SAW WG Eligibility</u>
No criteria on expertise or conflict of interest have been written for the SAW WG.

Option 1 (Preferred): <u>Eligibility (Independence, Expertise, and No Conflict of Interest)</u>

- SAW WG members should not actively participate on another committee or panel whose purpose is to peer review the products of the SAW WG. This will maintain **independence** between those who produce the stock assessment and the subsequent peer review.
- SAW WG members must have **expertise** and education directly aligned with the expertise needed to address the specific assessment TORs for the stock assessment. Generally this includes experts in the following core assessment areas: Biology, Ecology/Ecosystem Science, Data and Survey Design (Fishery-Independent, Fishery-Dependent Data), Mathematics/Statistics and Modeling Methods, and Fishery Management. This includes experts involved with state, federal, or international fisheries, academics, or fisheries management entities.
- There are many types of **conflict of interest**, some of which are serious enough to exclude an individual from being on a SAW WG. This will be determined during the WG selection process described in the Preferred Option of Section 2.1.2. As part of the selection process, all candidates for SAW WGs will be required to fill out a Conflict of Interest form which will be reviewed by the SAW WG chair and a higher level selection committee. In addition, at the start of a SAW WG meeting, members will, in writing, 1.) affirm to the WG Chair and SAW WG that they do not have a **conflict of interest** that would preclude their fair participation on the SAW WG (as defined in this document) and 2.) identify all groups they represent **A conflict of interest occurs if an individual**:

-is directly employed/paid by an advocacy group to represent a certain position and/or to achieve a desired outcome for some organization regardless of the scientific results that would be derived from a fair and impartial analysis of available data. (Those hired consultants who pass the conflict of interest standard and who satisfy the other eligibility requirements [i.e., independence, expertise] may be members of SAW WGs. The process described in the Preferred Option of Section 2.1.2 will be used to make final decisions about who can be on a SAW WG.)

- has agreed to terms of their employment that would cause a conflict of interest.

- has a direct financial stake in the outcome of the assessment. An example of a direct financial stake would be if an individual will receive money, grants or other financial benefits for achieving a particular outcome during the SAW WG process, regardless of whether that outcome is supported by the available scientific information.

2.1.2. Working Group Selection and Approval

No Action: <u>Ad Hoc</u>
There is no formal process for forming a SAW WG. Essentially, whoever attends the meeting is automatically on the workgroup. This could include previous workgroup members or additional persons who show up.

Option 1 (Preferred): <u>Working Group Chair and NRCC Deputies</u>
When a stock is scheduled for an upcoming SARC peer review, the SAW WG chair, with assistance from the lead assessment scientist, should make a general public announcement that the SAW WG is seeking candidates for membership. The SAW WG Chair will then identify the initial workgroup membership list, after having ensured that each member on list is willing to participate. Each candidate will be required to fill out a Conflict of Interest form that will be used to determine whether the candidate has a conflict of interest that would prevent him/her from serving on the SAW WG. The list of candidates along with their Conflict of Interest forms will be provided to the committee comprised of Deputies from each of the NRCC organizations (NMFS-NEFSC, NMFS-NERO, MAFMC, NEFMC, ASMFC) for review and decisions regarding approval. Approval would not require an in-person meeting, and approval could be obtained via email or conference call. If a selected member is not approved, the SAW WG Chair would be notified. The Chair could make an alternative member recommendation (based on input from the approval body) to be considered for approval. The SAW WG Chair has the option to proceed without finding a replacement for the disapproved member.

Other considered but <u>not</u> preferred subcommittee alternatives: The NRCC subcommittee considered if just the WG Chair alone should be responsible for both selecting and approving the SAW WG, but felt the additional input from NRCC organizations would be valuable (for both NMFS internal and external chairs). The group considered if any other groups should be engaged in approval of the SAW WG. The NRCC and NEFSC Center Director were considered, but not preferred, on the basis that those entities are already extremely busy (NRCC has full agenda 2 times a year) and will likely rely on their deputies and staff for input, which could be achieved through Preferred Option 1 above. The Council Executive Committee was also considered, but not considered appropriate on the basis that that group is very large and highly political, and the approval of an assessment WG should not be a political process. In addition, the SSC was considered but probably should not play a large role in WG member approval as this may set up a conflict of interest given the SSC will ultimately review this group's work.

2.1.3. Notification of Workgroup and Meeting Participants

No Action: <u>Ad Hoc</u>
No standard process is used to notify the SAW WG members. The SAW WG Chair or SAW Chair (from NEFSC) addresses this on an assessment by assessment basis.

Option 1 (Preferred): <u>After TORs Developed</u>
Identification of the SAW WG is completed after the assessment TORs have been developed and set. This is well in advance of the first WG meeting (e.g., generally 4-8 months on advance), and the SAW WG Chair or SAW Chair should notify all interested parties by posting the names of the SAW WG members on the SAW website or on a share drive set up for the WG, along with any meeting agendas and materials.

Other considered but not preferred subcommittee alternatives: The WG considered the use of fixed timeline (e.g., 45 days, 90 days, etc.), but this varies from assessment to assessment. TORs are generally developed 4-8 months in advance of the first assessment workgroup meeting.

2.1.4. Working Group Meeting Participants List

No Action: <u>Ad Hoc</u>
No standard process will be used to develop and maintain lists of SAW WG members or parties interested in the assessment. Presently, the WG Chair maintains an informal email list based on previous participants, and sends out emails prior to the first data meeting.

Option 1 (Preferred): <u>Improvements to NEFSC SAW Website</u>
A more enhanced section on the SAW webpage will be developed, which not only lists the schedule for data and modeling meetings (as is done presently), but details who is the WG Chair, how to be added to a email list for the workgroup (who to contact), and SAW WG membership.

Other considered but not preferred options: The WG considered shifting additional responsibilities to WG Chairs for updating contacts, but rejected this on the basis that some chairs may not be amenable to these additional responsibilities. The group also discussed possible list serve sign-ups which may be something to consider in the future, which would also place additional tasks on the WG chairs and SAW chair.

2.2 . Size of a SAW WG and selection of the WG chair

Background / Rationale
Action alternatives are presented below for SAW WG sizes up to 8 individuals. WG size will vary by stock assessment, and is dependent on the specific expertise needed to inform and develop analyses/models to complete the assessment. Typically, the following types of information and their analytical components are combined to build an assessment product: (e.g., Biology, Ecology/Ecosystem Science, Data and Survey Design (Fishery-Independent, Fishery-Dependent Data), Mathematics/Statistics and Modeling Methods, and Fishery Management.).

It is advantageous to keep WGs reasonably small to allow for consensus building and efficient development of stock assessments.

Action alternatives are presented below on who determines the WG Chair. The chair facilitates and guides assessment development discussions and strives for consensus decisions. When consensus cannot be reached, the SAW WG chair is responsible for deciding whether one or multiple primary surveys, models, etc. are brought forward for review and who will present the assessment information to the SARC (see Sections 2.2.2 and 3.4).

2.2.1. Working Group Size

No Action: **<u>No limits</u>**
No criteria or limits are set on the size of the SAW WG.

Option 1 (Preferred): <u>4-8 SAW WG members</u>
SAW WG size may consist of 4-8 members, comprised of the WG chair and individuals with expertise and balanced representation in each of the core assessment areas required to address the assessment terms of reference (e.g., Biology, Ecology/Ecosystem Science, Data and Survey Design (Fishery-Independent, Fishery-Dependent Data), Mathematics/Statistics and Modeling Methods, and Fishery Management.). The specific number of members within this range depends on the overall workload of the assessment and range of expertise required to complete the assessment. It is the WG chair's responsibility to determine how many members are needed to achieve sufficient expertise and balance of opinions within the group.

Option 2: <u>Small SAW WG</u>
SAW WG has a maximum of 4 members, comprised of the WG chair and individuals with expertise in the core assessment areas required to address the terms of reference (e.g., Biology, Ecology/Ecosystem Science, Data and Survey Design (Fishery-Independent, Fishery-Dependent Data), Mathematics/Statistics and Modeling Methods, and Fishery Management.)

2.2.2. Working Group Chair Selection

The WG Chair is responsible for ensuring a constructive meeting environment for all participants. The WG Chair facilitates consensus building and is responsible for ensuring consensus decisions are made regarding assessment inputs, model selection, and final workgroup products/SARC presentations. The chair does not make decisions unilaterally with regard to assessment products, but guides decisions made by the full WG. In cases where consensus cannot be reached, the WG Chair makes final determinations on WG products presented to the SARC. For instances where a minority opinion or multiple 'best models' (See Section 3) are brought to the SARC, the SAW WG chair will present the minority opinion and alternative models associated with it and describe how this differs from the majority opinion.

No Action: <u>NEFSC appoints Task Leaders to be WG chairs, in most cases</u>
NEFSC Population Dynamics Branch Task Leaders (e.g., southern demersal) chair SAW WGs in most cases. For contentious stocks, the Center may recommend an external chair from Council staff, academia, or other external institutions.

Option 1 (Preferred): <u>NEFSC appoints Task Leaders, in most cases, and with some input from NRCC Deputies.</u>
NEFSC Population Dynamics Branch Task Leaders (e.g., southern demersal) chair SAW WGs in most cases. For contentious stocks, the Center may recommend an external chair from Council staff, academia, or other external institutions. The NEFSC decides who the chair is from among the Task Leaders, except with contentious stocks, in which case the NRCC Deputies are consulted on the final decision.

Option 2: <u>Self-Elected by WG</u>
WG chair is selected by WG itself; therefore, any WG members including the lead assessment scientist could chair the WG if elected. If this alternative is selected, then the SAW WG Chair cannot be responsible for identification of the initial SAW WG membership list (as described under Option 1 in section 2.1.2), as the workgroup will have to be formed by another entity.

Option 3: <u>NEFSC Director Selects Chair</u>
WG chair is selected by NEFSC Director. The chair may be a fisheries scientist from within or outside of the NEFSC staff, and is chosen from experts from state or Federal natural resource agencies, or from academia or international fisheries science institutions.

Option 4: <u>NEFSC Director Selects Chair followed by NRCC Review</u>
WG chair is identified by NEFSC Director, and approved by the NRCC. The chair is a fisheries scientist from within or outside of the NEFSC staff, and is chosen from experts from state or Federal natural resource agencies, or from academia or international fisheries science institutions.

3.Guidance on how SAW WGs function

3.1. WG formation, composition, and participation

The SAW WG chair, with assistance from the lead assessment scientist, should make a general announcement that the SAW WG is seeking candidates for membership. The SAW WG Chair will then identify a list of WG members which will be checked for approval (see Section 2.1.2). WG membership requires a high level of commitment. WG's should achieve a balance of opinions and expertise in all areas relevant to the stock being assessed. An imbalance of membership may lead to over-emphasis on one area of the assessment or excessive advocacy for a certain position. Members are strongly encouraged to participate in all of the SAW WG meetings used to develop the assessment. To ensure efficient progress and timely delivery of the assessment, WGs should not revisit decisions that they made at an earlier WG meeting. WG members cannot engage after a WG meeting to overturn decisions made earlier by the full WG (e.g., about data set inclusion/exclusion, or model specification and selection decisions).

3.2. Number of WG meetings to have before the SARC Review

There is flexibility in the number of WG meetings that must be held. It depends on the complexity and importance of the benchmark stock assessment. Most SAW WGs schedule 1-3 WG meetings to evaluate data, models, BRPs, stock status, and projections. Having a special meeting with the public (see below) to discuss major issues involved with the benchmark assessment is also encouraged, if adequate time and resources are available.

3.3. Wide net for sources of data

When a WG is formed, the lead assessment scientist and the WG chair should seek to acquire all data relevant to the TORs for that stock assessment. This may include new sources of information, as well as data not collected by the NEFSC. Acquiring such data sets can be done in various ways (e.g., sending email requests, press releases, phone calls, or holding a public meeting with industry/academia to discuss the strategy for conducting the stock assessment, and any major issues related to the assessment). If relevant peer-reviewed publications exist, the WG chair and lead scientist should consider contacting the author(s) to indicate that this published information is being considered for use in the assessment (also see Section 3.7).

When new data sets are obtained, the WG should review the quality of these data and determine whether the data meet scientific standards for inclusion in the assessment. If the data do not meet these standards, the WG should not include the data in the assessment and should document why the data were not included.

Research to support a stock assessment should begin after the previous benchmark assessment is completed, based on the research recommendations.

3.4. How the WG makes decisions

--Definition: **Consensus decision-making** is a group decision-making process that seeks the consent of all participants. Consensus may be defined professionally as an acceptable resolution, one that can be supported, even if not the "favorite" of each individual.

--Consensus: SAW WGs should strive to achieve consensus. This is because SARC reviewers are generally very adept at evaluating whether an analysis presented to them is technically appropriate, but they struggle with resolving complex issues that a SAW WG was unable to resolve. The SARC generally respects the expertise and time devoted to these issues by the SAW WG, but the SARC has limited time to resolve or delve deeply into contentious issues that may have caused dissension within a WG.

--Minority opinions: During SAW WG meetings the WG chair should seek out, but not force, a consensus of the WG on major assessment issues. If a SAW WG, which has up to 8 members, is unable to reach consensus on an assessment, a minority opinion can go forward to the SARC only if more than one WG member has the minority opinion. During the SARC peer review the SAW WG Chair, rather than a WG member, will be responsible for explaining the minority opinion and describing how it differs from the majority report.

--Documentation of WG decisions: The WG chair should keep a log of the decisions made during each day of a WG meeting. The WG Chair's daily log should describe the decision, the logic and reasons behind the decision, the number of WG members who supported the decision, and the names and number of WG members in attendance at each meeting.

3.5. Dealing with single best model or with multiple models

For any TOR in which one or more models are explored by the WG, the WG report should provide a detailed account of the "best" model, including inputs, outputs, diagnostics of model adequacy, and sensitivity analyses that evaluate the robustness of model results to assumptions. In less detail, all other models evaluated by the WG should be described and the strengths, weaknesses and results of the other models explained in relation to the "best" model.

Ideally the WG will be able to decide on and select a "best" model. However, when this is not possible, the alternative model(s) should also be described in detail, and the relative utility of each model summarized, including a comparison of results. It should be highlighted whether any of the models represents a "minority" opinion (see Section 3.4) of the SAW WG.

For the "best model", include one or more tables that describe the model structure (for example: model type or name, age- or length-based, sex-based, types of landings and discard data, length-weight parameters, maturity parameters, size bins, time bins, M assumptions, surveys used, model years for surveys and catch, etc.).

3.6. SAW WG Chair's Responsibilities

The WG Chair is responsible for chairing the SAW WG Meetings (e.g., Data, Modeling, and Biological Reference Points), assuring that assessment reports are prepared on time, and attending the SAW/SARC review as a WG representative along with the lead assessment scientist. The WG Chair is responsible for determining who makes presentations to the SARC. (Additional responsibilities are mentioned in other sections such as 2.2.2 and 3.4.)

3.7. Invited collaborators

As noted earlier (Section 2.1) the SAW WG is not intended to include every expert or researcher involved in every assessment issue. However, the WG process may benefit from including some

invited collaborators who can contribute particular information. The WG Chair may invite individuals to attend WG meetings who contribute research papers or who have particular expertise and present information to the WG as appropriate. These invited collaborators are not WG members, and while they may engage in a full discussion with the WG, they may not participate in WG consensus decisions. It is the responsibility of the SAW WG chair to run the meeting in this manner.

3.8. Rules of Engagement among members of a SAW WG

Anyone participating in SAW assessment working group meetings that will be running or presenting results from an assessment model is expected to supply the source code, a compiled executable, an input file with the proposed configuration, and a detailed model description in advance of the model meeting. Source code for NOAA Toolbox programs is available on request. These measures allow transparency and a fair evaluation of differences that emerge between models.

April 14, 2014

Tom Nies
Executive Director
New England Fishery Management Council
50 Water Street, Mill 2
Newburyport, Massachusetts 01950

Dear Tom,

The Atlantic States Marine Fisheries Commission's Atlantic Herring Section (Section) is seeking to better understand the timing and magnitude of the herring spawning events in the offshore areas of Nantucket Shoals/Georges Bank. The Section feels the protection of spawning fish in these offshore areas is necessary to ensure the long-term sustainability of sea herring.

Based on the Section's interest, I have requested this issue be added to the agenda for the upcoming Northeast Regional Coordination Council (NRCC) meeting. The Section requests a strategy be developed to study offshore spawning events, particularly in the Nantucket Shoals/Georges Bank area. This strategy can only be successful with collaboration and support from the Council, the Greater Atlantic Regional Fisheries Office (GARFO), and the Northeast Fisheries Science Center (NEFSC).

Atlantic sea herring is an important species that sustains marine ecosystems and valuable fisheries such as American lobster, striped bass, blue crab, and bluefin tuna. Since the initiation of the Herring Fishery Management Plan, the Atlantic States Marine Fisheries Commission (Commission) has considered the need to learn about spawning events a priority in order to effectively manage the resource. The Commission has implemented spawning studies and monitoring for the inshore spawning areas which inform the herring area closures. The Section is concerned little information known about the Nantucket Shoals/Georges Bank offshore spawning events. Although the stock is considered to be rebuilt based on the 2012 assessment, spawning fish must be protected not just near the coast, but in offshore waters as well, to ensure long-term sustainability of sea herring.

The Commission's Atlantic Herring Technical Committee (TC) has evaluated the resources needed to study spawning events in offshore area of Nantucket Shoals/Georges Bank. The enclosed TC report provides an estimated budget needed to design an offshore sampling protocol, hire personnel to process and analyze samples, and over costs of supplies and transport.

The Section values the partnership with the Council and feels additional collaboration on spawning issues will improve the management of this resource. Please contact me if we can provide any additional information.

Sincerely,

Robert E. Beal

cc: John Bullard
Dr. William Karp
ASMFC Atlantic Herring Section

Enclosed: 1. ASMFC Atlantic Herring TC Report: Potential issues and considerations with Georges Bank/Nantucket Shoals off shore spawning area (October 2012)
2. ASMFC Atlantic Herring TC Report: Follow-up to the Section's Consideration of Georges Bank/ Nantucket Shoals Offshore Spawning Study (October 2013)

L14-10

October 2013

To: **Atlantic Herring Section**

From: **Atlantic Herring Technical Committee**

RE: **Follow-up to the Section's Consideration of Georges Bank/ Nantucket Shoals Offshore Spawning Study**

Introduction

In October 2012, the Technical Committee (TC) presented a report to the Atlantic Herring Section on the potential issues and considerations in the Georges Bank/ Nantucket Shoals offshore spawning area. The report highlighted three issues: 1) goals, objectives, and potential fishing effort relocation; 2) implementation of a 3-year study to define effective offshore management measures; and 3) identification of potential long-term funding for inshore and offshore sampling programs.

In response, the Section asked the TC to expand on the report with 1) specific budget needs for resources, such as personnel and transport; 2) alternative sampling measures to address the challenge of transporting fresh offshore samples; and 3) possible management options for offshore spawning areas.

The TC discussed these three issues via conference call on July 22. The TC had concerns that spawning in Georges Bank/ Nantucket Shoals can be very different from inshore events and may require a distinct set of management measures from the current state-water management program. Currently, states' spawning research is used to inform management of inshore spawning areas. In order to advise management measures in federal waters, it is necessary to study offshore spawning events by sampling and analyzing sea herring during the 3-month reproductive season. A significant challenge to offshore sampling is that the analysis, gonadosomatic indexing (GSI), requires fresh samples that have never been frozen; however, it can take days to transport the fish from federal waters to laboratories for analysis. Existing sampling methods used for inshore spawning analysis would not apply to offshore sampling. Therefore, states will require a new sampling protocol for collecting fresh specimens from the Georges Bank/ Nantucket Shoals area for GSI.

#1 State Budgets for Spawning Studies

In its October 2012 report, the TC advised the Atlantic Herring Section that a dedicated funding source be identified for the existing inshore sampling and a 3-year study to determine if a distinct offshore spawning structure exists. The TC has compiled the following state budget estimates for the collection and analysis of spawning samples. Table 1 lists each state's estimated costs for personnel to gather, process, and analyze samples; design an offshore sampling protocol; supplies; transport of fresh samples; and overhead.

Estimated State Budgets

Instructions for TC members: In the table below, please estimate the costs for resources your state requires for its current inshore sampling, as well as any additional costs for sampling in the offshore spawning areas for one spawning season. Please consider the following expenses:

- Personnel (for gathering, process, and analyzing samples)
- Design of a new protocol for offshore sampling
- Supplies
- Transport
- Overhead

Table 1. Estimated state budgets needs to fund inshore and offshore spawning studies.

State	Number of New Staff	Current Costs for Inshore Sampling	Additional Costs for Offshore Sampling	TOTAL
ME	1 FTE 1 part-time (seasonal)	$40,000-50,000	$50,000-65,000	$90,000-115,000
NH*		$0	$0	$0
MA		$4,452	$5,102	$9,554
			TOTAL	**$90,000 - $124,554**

* New Hampshire does not conduct sampling and analysis, but Maine and Massachusetts' sampling programs includes fish from NH waters, and those costs are included in the budgets.

#2 and #3 - Alternative sampling measures and possible management options for offshore spawning areas

At this time, the TC cannot address the Section's request for alternative sampling measures and offshore spawning management options because funding is needed to design a new offshore sampling protocol, and a study of offshore spawning events must be conducted to inform management measures.

Additional Comments Regarding the Georges Bank/ Nantucket Shoals Spawning Study

- TC members would like managers to clearly state their goals and objectives for the study and implementation of management measures.
- A TC member questioned the use of state funding for offshore spawning research in federal waters. Priority should be placed on portside sampling.
- The Interjurisdictional Fisheries Act funding is typically used by states to fund ongoing programs, and should not be considered as additional funding for a new study on Georges Bank/ Nantucket Shoals spawning.

Potential issues and considerations with Georges Bank/Nantucket Shoals off shore spawning area

Report to the Atlantic Herring Section from the Technical Committee

Introduction

Recently a number of managers and stakeholders have suggested that Atlantic herring should have spawning protections both offshore and inshore. Currently, spawning restriction only exists for the inshore component of the Atlantic herring resource and are managed and monitored by the States with direction from ASMFC. However, there are a number of concerns and clarifications the Section may want to address prior to initiating management action through an Addendum or Amendment.

Historically, ASMFC has managed three inshore Gulf of Maine spawning areas; Eastern Maine, Western Maine, and MA/NH (Figure 1). During initial plan implantation the Federal government considered similar options for inshore spawning protection, but these were later disapproved by the regional office of NMFS (NMFS, 2000)

Since plan implementation in 1999 (ASMFC, 2006) and until 2007 a 20% tolerance was put in place to prevent removal of spawning adult fish in the inshore. This tolerance was later rescinded, requiring all directed vessels to harvest in areas other than those closed. Closures for each of the inshore areas are determined either by commercial catch sampling or by predefined default dates (see Addendum V). To determine closures:

> *(b) Determination of starting dates for spawning areas.*
> *Closures in a given area will begin based on a pre-determined spawning condition of Atlantic herring indicated by commercial catch samples. This spawning condition will be defined as: female herring greater than or equal to 28 cm in length having reached a mean gonadosaomatic index (GSI) of 20%; or female herring greater than 24 cm and less than 28 cm in length having reached a mean GSI of 15%. Closures in a given area will begin seven (7) days after the GSI determination is made. If sufficient samples are not available, closures will begin on area specific dates as follows: Eastern Maine- August 15, Western Maine- September 1, Massachusetts/New Hampshire- September 21.*
> *(c) Duration of spawning area restrictions.*
> *The closure will extend for four (4) weeks. If catch sampling after the end of the initial restricted period determines that 25% or more mature herring, by number, have yet to spawn then the spawning restrictions would resume for an additional two weeks.*

To effectively monitor these rolling closures, states collect 100 fresh fish samples from the commercial fishery in each area prior to and again just after spawning. Fresh samples are obligatory for spawning determination as frozen samples make proper ICNAF staging and GSI determination impossible due to ice crystals formation and water retention in the body and gonads. These samples are more arduous to collect and process, as GSI determination and staging takes place in a laboratory setting, and transport from landing facility and processing has to be completed in 24 hours due to sample degradation. Maine DMR routinely collects 50-75, 100 fish samples a year to determine proper closures and possible extensions. MA DMF personnel collect about one half the samples from the MA/NH Area, as most vessels land in Maine when the Western and Eastern closures are effective.

Implementation of spawning area management for the offshore Georges Bank/ Nantucket Shoals component of the Atlantic herring resource presents some challenges similar to the inshore component of the resource. As such, the TC would like to highlight a number of issues.

Issue 1: Goals and Objectives

The Current goals and objectives as outlined in Amendment 2 are:

> *• To harvest the U.S. Northwest Atlantic herring resource consistent with the definition of overfishing contained in Amendment 2.*
> ***• To prevent the overfishing of discrete spawning units consistent with the national standards.***
> *• To avoid patterns of fishing mortality by age which adversely affect age structure of the stock.*
> ***• To provide adequate protection for spawning herring and prevent damage to herring egg beds.***
> *• To promote U.S. and Canadian cooperation in order to establish complementary and real-time management practices.*
> *• To implement management measures in close coordination with other Federal and State FMPs.*
> *• To promote research and improve the collection of information in order to better understand herring population dynamics, biology, and ecology, improve science in order to move to real-time management and to improve assessment procedures and cooperation with Canada.*
> *• To achieve full utilization from the catch of herring, including minimizing waste from discards in the fishery.*
> *• To maximize domestic use, such as lobster bait, sardines, and other products for human consumption, and encourage value-added product utilization.*
> *• To promote the utilization of the resource in a manner, which maximizes social and economic benefits to the nation and taking into account the protection of marine ecosystems and it value as a forage species.*

Of these "To provide adequate protection for spawning herring and prevent damage to herring egg beds." seems most relevant. However inshore spawning restrictions have been effective in meeting another plan objective "To prevent the overfishing of discrete spawning units consistent with the national standards." During spawning, sub-components of the complex of Atlantic herring are found on their respective spawning grounds. Given that many of the vessels currently harvesting herring from off-shore areas can switch to purse seining, and that inshore and offshore spawning occurs concurrently; it is likely that spawning restrictions in the off-shore area will move effort inshore as noted in Amendment 2.

> *4.3.2 Spawning Restrictions*
> *Landing restrictions on spawn herring are designed to conserve the stock by ensuring recruitment to the stock. Much of the management program is designed to move effort into the offshore areas where the TAC has not been fully harvested and the spawning component is thought to be strong. The inshore component is the most vulnerable component of the stock complex; therefore, management measures are focused on providing the greatest protection to the component that is thought to be most susceptible to overfishing.* ***Protection to the offshore spawning component would come at the expense of putting more pressure on the inshore component of the stock complex.***

Given that the general consensus that the meta complex for Atlantic herring is above Bmsy, that the off-shore component of the resources is probably not at full utilization, and that the inshore component may be at or near harvesting capacity, managers will have to clearly state goals and

objectives for implementation. Particularly given that such restrictions may inadvertently lead to increased exploitation on the inshore component just prior to or just after spawning.

Issue 2: Data gathering

As stated previously, fresh samples are needed to monitor spawning areas. However, such samples are not currently available for the off-shore component of the resource. Generally, off-shore and inshore components spawn at roughly the same time, and as such, priority for fresh samples has always been given to the inshore due to ASMFC regulations. Further, the current spawning area management relies on estimations of spawning activity as monitored by GSI. While the relationship between GSI and ICNAF spawning stage are well known for the inshore component, it is likely that the off-shore component will have a different relationship due to differences in growth and maturity schedules. Additionally sampling will also be needed to determine if appropriate default closure dates can be applied, similar to inshore spawning management.

While the Georges Bank Nantucket Shoals component most likely spawns continually during the season (Figure 2), it may have spatial and temporal structure similar the inshore component; requiring subarea management. Sampling will determine if structure is present and how to incorporate that into a management scheme if it is.

Because of the lack of fresh samples from that area, the potential differences between inshore and offshore timing and growth, and the potential need for sub area management, a three year study in most likely required prior to implementation.

Issue 3: Funding

Currently the state of Maine dedicates two half-time time technicians and one part time (<15%) analyst during the three month spawning season. These personnel gather and process samples, and analyze the results. These personnel costs, coupled with transport, supplies, overhead etc. translate to approximately $40,000-$50,000 a year to monitor the current inshore spawning areas. Given the aerial extent of the proposed off-shore spawning area, a similar additional cost would be expected to monitor an off-shore spawning area.

Monitoring of current ASMFC spawning areas is accomplished using ACCSP, IJF, State of Maine, and State of Massachusetts General funds. However, Atlantic herring has not been listed as a priority species for ACCSP funding for 2013. This coupled with the loss of IJF funding, and reductions in general funds among all the states, suggests current spawning area sampling will not continue in the short term. If off-shore spawning area management and the prerequisite sampling program is to be accomplished, a dedicated long term funding source will need to be identified.

Conclusions

Off-shore spawning area management has been considered previously by both the NEFMC and ASMFC. Such measures may provide benefits to the off-shore component, but would be balanced by a number of trade-offs. Overall it would be feasible to implement a management regime similar to what is conducted for the inshore component; but managers should be aware of important tradeoffs as well as other issues associated

with implementation. Prior to implementation the Section may wish to consider the following;

1) Goals, objectives, and potential effort relocation
2) Implementing a 3-year study to help define effective management measures
3) Identification of potential long term funding sources including federal, ACCSP, and state funds

Once considered, these issues could form that back-bone for further management action or to direct further research on off-shore spawning area management.

Literature cited

NMFS. 2000. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Atlantic Herring Fishery; Atlantic Herring Fishery Management Plan Federal Register. 15 CFR Part 902 50 CFR Parts 600 and 648

ASMFC. 2006 Amendment 2 to the Interstate Fishery Management Plan for Atlantic Herring

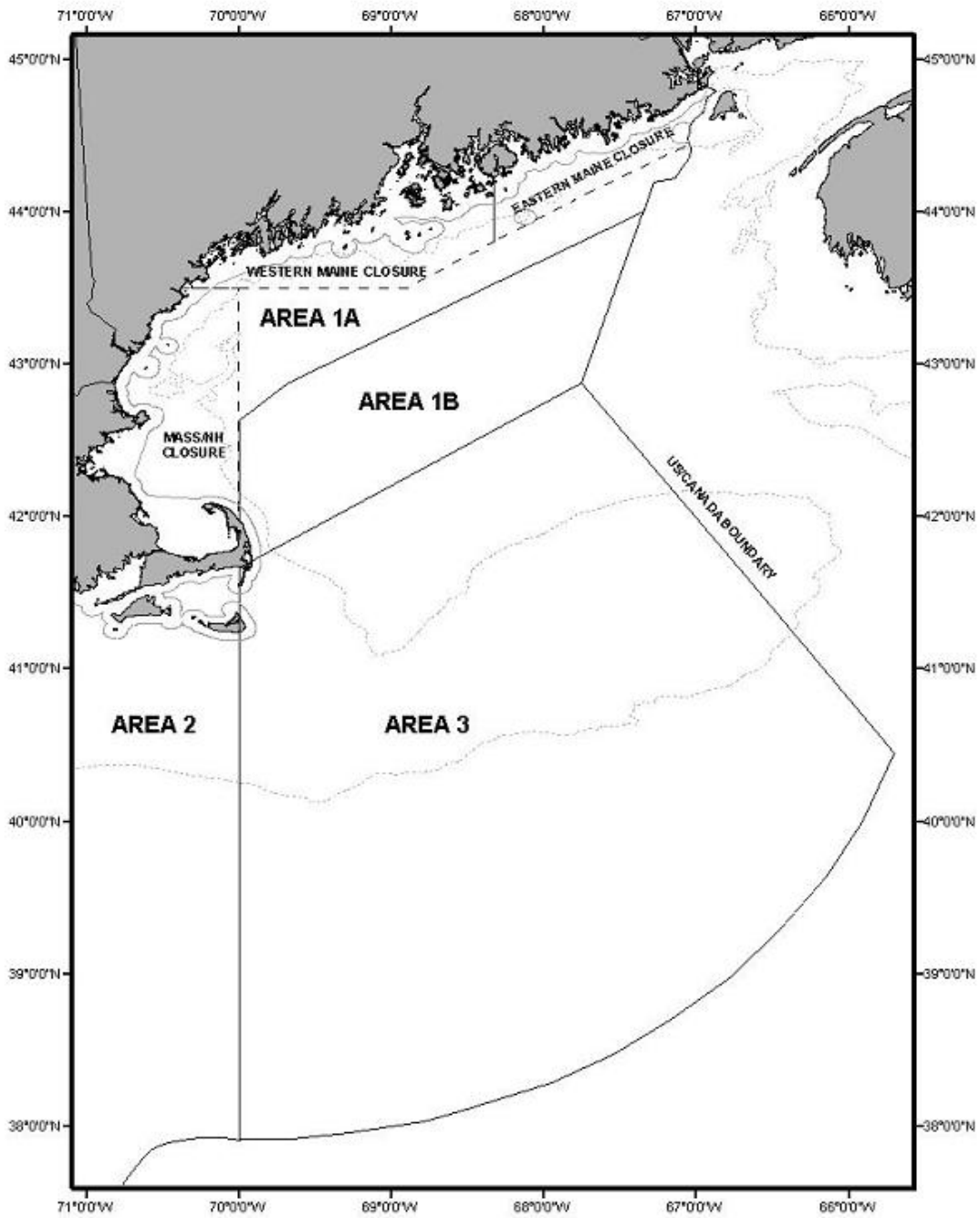

Figure 1: Current Spawning Areas for the Inshore Gulf of Maine

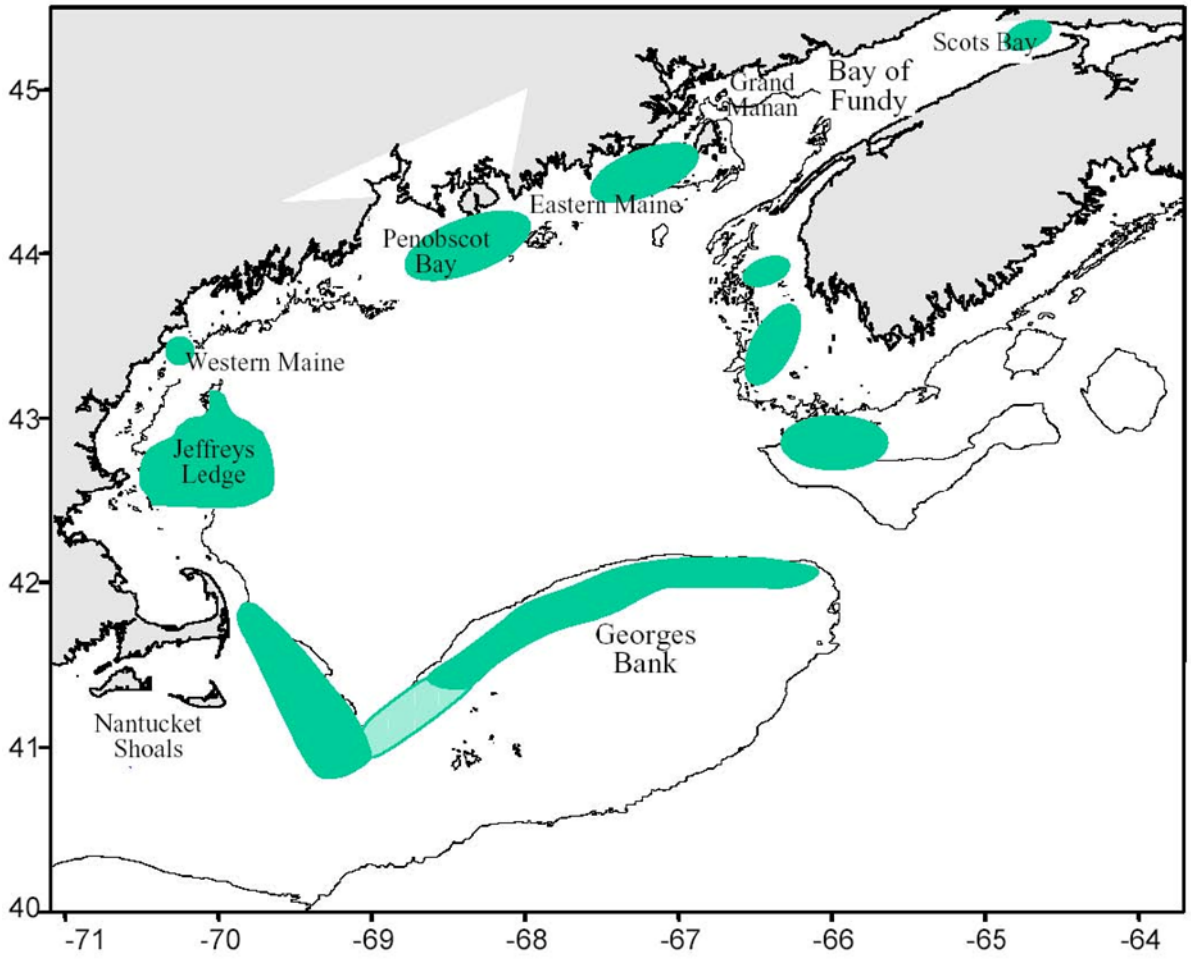

Figure 2: Generalized view of the current major herring spawning areas in the Gulf of Maine and on George Bank (from Overholtz et al. 2004)