

Mid-Atlantic Fishery Management Council
Executive Committee Meeting
December 1, 2011
Agenda

1. Ecosystem Based Fishery Management Issues

- Develop Statement of Purpose and Need
- Progress on ESC TOR 1 (Goals and Objectives)
- Forage Issue Update
- TOR 4 Update (National SSC IV Summary)
- Development of Ecosystem Based Fishery Management Plan

2. 2012 Planning and Priorities

3. Council SOPPs

*Draft MAFMC Ecosystem Based Fishery Management Plan (EBFMP)
Purpose and Need Statement*

The purpose of the EBFMP is to enhance the Council's species-specific management programs with more ecosystem science, broader ecosystem considerations and management policies that coordinate Council management across its Fishery Management Plans (FMPs) and the Mid-Atlantic Bight and SNE Ecosystems. An EBFMP should provide a framework for considering policy choices and trade-offs as they affect FMP species and the broader ecosystems.

The needs for ecosystem-based fishery management within the Council process are:

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

ATT: 1

Mid-Atlantic Fishery Management Council
Development of Ecosystem Goals, Objectives, and Policies
Draft Strategic Plan

The following proposal was developed to develop a roadmap to be used by the Council and staff to develop an "ecosystem based" approach to fishery management (EBFM). The first step in this process was the development of an Ecosystems Subcommittee (ESC) of the SSC to "advise the Council on ecosystems management and ecological issues related to the Council's Fishery Management Plans (FMPs) and management programs". The objectives of the ESC are articulated in the TORS developed for them by the Council as follows:

Provide scientific advice or information to:

1. support and inform the development of the Council's ecosystem level goals, objectives and policies.
2. address and incorporate ecosystem structure and function in Council FMPs and quota specification process to ensure ecological sustainability.
3. anticipate or respond to shifting ecological conditions (climate change and other externalities).
4. summarize existing programs (US and worldwide) that have incorporated ecosystem-based management principles.
5. describe ecosystem principles to evolve into regional-based ecosystem based FMP.

The TORS developed by the Council include both short and long term issues related to EBFM. For the long term, the Council has expressed its desire to move in the direction of EBFM but has yet to articulate specific goals and objectives. The problem of developing EBFM goals and objectives is challenging because they depend to some degree on what is technically feasible given current or information expected to be available in the foreseeable future. However, it is important that some initial attempt be made by the Council to articulate its long term EBFM goals and objectives.

Recommendation: Council should establish draft EBFM goals and objectives (these goals and objectives can be modified through an iterative process with the ESC).

The Council's Executive Committee will develop an EBFM goals and objectives statement and to oversee subsequent Council activities and interactions with the ESC related to EBFM. In addition to developing a long term strategic plan for EBFM, the Executive Committee is developing a list of short term issues for which the Council needs the ESC to address. The Executive Committee tasks the ESC with developing scientific advice specific to the forage issue currently being discussed by the Atlantic Mackerel, Squid and Butterfish Committee. Additional topics for the ESC to consider will be developed sequentially so the ESC can provide the necessary scientific advice to inform the development of the Council's long range approach to EBFM.

Mid-Atlantic Fishery Management Council (Council)

Ecosystems Subcommittee of the Scientific and Statistical Committee (SSC)

Terms of Reference

Organization

The Ecosystems Subcommittee of the SSC will be appointed by the Chairman of the SSC.

Function

The Subcommittee will advise the Council on ecosystems management and ecological issues related to the Council's Fishery Management Plans (FMPs) and management programs.

Objectives

1. Work with the Council (especially the Council's Ecosystems and Ocean Planning Committee) to provide the Council with scientific advice to support and inform the development of the Council's ecosystem level goals, objectives, and policies.
2. Identify and describe scientific advice that the Council could use to address and incorporate ecosystem structure and function in its fishery management plans (FMPs) and quota specification process to ensure that the Council's management practices effectively account for ecological sustainability.
3. Describe scientific information that the Council could consider to anticipate or respond to shifts in ecological conditions (e.g. climate change and other externalities) or processes in its management programs.
4. Summarize what other countries and regions are doing to incorporate ecosystem-based fishery management principles in their management plans and programs.
5. Describe how ecosystems principles could be used by the Council in the long term to evolve its single-species and multi-species FMPs into a regional ecosystem-based fishery management plan.

Guidance for Developing Ecosystem-
Based Approaches for Fisheries
Management in the Mid-Atlantic Region

Presentation
SSC Subcommittee on EBFM
27 July 2011

E. D. Houde

Att: 3

Thoughts on EBFM. Hilborn (2011)

Phase 1.

“The most important elements of EBFM are keeping fishing mortality rates low enough to prevent ecosystem-wide overfishing, reducing or eliminating by-catch, and avoiding habitat-destroying fishing methods.”

Phase 2.

“Extended EBFM that consists of considering trophic interactions and area-based management.”

Developing a Vision

What does the Council Envision for EBFM in the Mid-Atlantic Region?

May I suggest:

1. A productive and healthy ecosystem.
2. Sustainable, productive, and profitable fisheries.
3. Recognition and respect for ecosystem services other than fisheries.
4. An engaged, broad stakeholder community.
5. A responsive, adaptive management system.

Goals Statement

- What specifically does the Council hope to achieve?
- In what timeframe?
- Define measures of success
- Adopt goals that do not limit a range of management actions

Overarching Principles

- Do no harm to the ecosystem (or as little as possible)
- Be an advocate for the ecosystem and services it provides
- Adopt, accept, and promote the precautionary approach
- Respect the broad community of stakeholders

EBFM Represents a Shift in Management Priorities and Perspective

Emphasis shifts from management of single species to achieve high yield and profit, generally by controlling catch and effort, to management that assures long-term productivity, a high level of ecosystem services, sustainable fisheries, and sustainability of the ecosystem itself.

Why develop and implement ecosystem-based approaches to fisheries management in the Mid-Atlantic region?

- To conserve the productivity, structure and resiliency of the coastal ecosystem
- To respect uncertainty; reduce risk of management failure
- To follow the “precautionary approach.” Do No Harm!
- To preserve options of future generations.

How can we gauge success?

- Indicators and Reference Points
- Limits and Thresholds
- Multiple Indicators
- Triggers for Action
- Spatially Explicit Actions

All of these may sound familiar and little different from what has been used in single species management, but the particular indicators, levels and limits, and triggers could be different. For example, F levels of forage species could be set much lower than traditionally or B could be higher. Or, the level of F and B on a predator might be regulated to manage a forage fish species.

EBFM Represents a Shift in Management Priorities and Perspective

- Conserve ecosystem integrity and resilience
- Promote habitat and water quality
- Pay particular attention to maintenance of key predator-prey relationships
- Manage total removals from the ecosystem

What Immediate Steps Can Be Taken to Adopt EBFM?

- Continue risk-averse, single-species fisheries management.
 - Set target fishing mortality levels below those that yield MSY.
 - Maintain adequate spawning stock biomass and fecundity.
- Regulate or deny use of gears that are destructive of key habitats or which result in unwanted bycatch.
- Reduce or eliminate bycatch.
 - Young and small individuals of targeted species.
 - Untargeted species, including threatened and endangered species.
- Consider and initiate development of new indicators and reference points.
- Rigorously enforce fisheries and environmental laws and regulations.

Intermediate Steps

- Place a cap on total fisheries removals from the ecosystem.
 - The cap should be flexible and adaptive, responsive to shifts in productivity of the ecosystem.
- Explicitly account for predator-prey interactions.
 - Recognize critical predator-prey interactions and manage to conserve prey resources.
 - Develop and incorporate multispecies modeling into assessments.
- Expand the use of spatially-explicit management approaches.
 - Managed areas.
 - Temporal-spatial management measures.
- Increase stakeholder involvement in the management process.
 - Further democratize diverse stakeholder inputs.
 - Recognize the diverse stakeholder interests (including, but beyond fisheries).

Long-term Steps

- Recognize and account for externalities.
 - Account for long-term shifts in productivity (e.g., climate change).
 - Improve water quality.
- Restore damaged habitats.
- Manage to conserve food-web structure and function.
 - Incorporate ecosystem modeling into assessments.
- Build on and expand on a “managed areas” approach.
 - Ultimately, zoning and networking to achieve EBFM and broader ecosystem management goals.
- Review institutional and governance structures to support EBFM.
 - Strengthen inter-agency collaboration and cooperation protocols.
 - Consider possible need for new institutions.
- Formally embrace and implement a broadly adaptive and integrative management approach to insure sustainable fisheries and continuation of other ecosystem services.

What is the Best Pathway?

- Build on Single Species management?
- Move aggressively towards Multispecies management?
- Develop and Implement a broad “ecosystem plan?”

Proposed Considerations for Term of Reference 1

Mid-Atlantic Fishery Management Council (Council)

Ecosystems Subcommittee of the Scientific and Statistical Committee (SSC)

TOR 1. Work with the Council to provide the Council with scientific advice to support and inform the development of the Council's ecosystem level goals, objectives, and policies.

There are three elements needed to address this TOR 1:

First is establishment of a *process* whereby such ecosystem goals, objectives and policies are discussed and agreed upon. The SSC ESC proposes any one of several approaches to do this, with the primary aim to ensure that the any such goals and objectives that are established do not extend beyond what is scientifically and technically feasible.

Examples of doing so include an "unpacking" exercise (O'Boyle and Jamieson 2006), structured decision-making (Miller et al. 2010; 3 of the authors are on the SSC), broad-level stakeholder workshops and meetings (Packer 2011), listening sessions (DeMarest pers. comm.), scoping meetings, and qualitative risk-analysis sessions, among others. Although the specific functional form of the process is variable and would depend upon what the Council would be most comfortable with and find most efficient, essentially what the ESC would propose are a series of iterative ecosystem sessions with the Council or appropriate subgroup thereof. In these sessions there would generally be some provision of example goals serving as a "strawman" or "strawmen" from which to start, a categorization of subsets of such examples mapped to salient issues and technologies/methodologies, be professionally facilitated, and be iterative.

The resultant goals and objectives would be broad policy statements directly noting how the Council would like to consider ecosystem considerations in the operations of the SSC.

Second, *examples* of such goals and objectives would be posited for the Council to consider cognizant of best practices elsewhere in the country and global community. The ESC's TOR 4 would necessarily inform such example goals and objectives. Many of the enabling legislative works, national standards, and principle statements therefrom would form the basis to constrain what is feasible, as expanded to consider ecosystem issues. For instance, an example overarching goal might be something to the effect of:

"Maintain Ecosystem Structure and Function to Allow Sustainable Harvest across an Ecosystem"

Or an example overarching objective might be something to the effect of:

"Maximize Yield/Economic Returns Subject to Constraints Designed to Protect Ecosystem, Social, and Economic Structures"

These examples are by no means meant to be prescriptive, but rather as illustrative of the types of goals and objectives being proposed for ecosystem-based fisheries management (and there is certainly no shortage of such examples). These goals and objectives would then iteratively be “unpacked” by the Council and ESC as it pertains to specific issues, *sensu* those issues alluded to in the ESC’s TORs 2, 3, and 5. One could envision a broad, overarching goal statement followed by more specific policy objectives addressing forage, bycatch, climate change, protected species, habitat, system-level constraint, biodiversity, spatial management, or other ocean-use sector issues.

Third, how these processes and examples result in actionable and operational *decision systems* would be explored after such ecosystem goals, objectives and policies were adopted. The ESC would deliberate on the methods most appropriate to consider such ecosystem considerations, cognizant of the need for consistency with the broader enabling legislation, but also the scientific capacity that constrains being able to do so. The ESC would explore how best to incorporate such ecosystem considerations into current control rule (fishery management plans (FMPs) and quota specification process) protocols, or whether further and distinct protocols would need to be developed at some point in the future. As EBFM issues continue to merge with broader EBM issues, it would be expected that the entire approach proposed here would need to be periodically revisited to ensure no ecosystem issues are being omitted.

References

Miller, Thomas J., Jeff A. Blair, Thomas F. Ihde, Robert M. Jones, David H. Secor, Michael J. Wilberg. 2010. FishSmart: An Innovative Role for Science in Stakeholder-Centered Approaches to Fisheries Management. *Fisheries* Volume 35(9) : 424 - 433 .

O'Boyle, Robert, Glenn Jamieson. 2006. Observations on the implementation of ecosystem-based management: experiences on Canada’s east and west coasts. *Fisheries Research* 79:1-12.

Packer, David (ed.). 2011. Mid-Atlantic Fishery Management Council’s Habitat-Ecosystem Workshop, Virginia Beach, VA, December 13-14, 2010, U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-115. 76 p.

Ecosystem Break-out Report

- 3 topics
- System Level OY
- Forage
- Goals & Objectives

System Level OY

- Key observation:
 - **System-level MSY DNE ESS MSYs**
 - Duly caveated
 - Implies we need to consider interactions at one level or another: species, technical, environmental, etc.
 - Need to define the “system” carefully
- Two main ways to address:
 - Add into Stock Assessments and “checks” in current ACL process
 - Consider a system or aggregate level MSY as a check and means for coordination across FMPs

System Level OY

- Three recommendations:
 - Review and compare approaches to estimate any fundamental features resulting from system-level OY estimates
 - Compare system-level production stability
 - More info/data re interactions (trophic, bycatch, etc.)
- General considerations:
 - More precautionary Fs, with attendant economic benefits
 - Use system OYs strategically first, move towards tactical use where appropriate
 - Need to change the burden of proof of why not include

Forage

- Key Observation:
 - **There is a clear need to define forage spp.**
 - Rationales why include huge and varying M2, as well as suitable food for other spp
 - Although definition is required, need to be careful as to what that criteria would be
 - Apt to be distinct criteria for each Council
- Multiple ways to address:
 - Uncertainty buffers to OFL/OY
 - Biomass thresholds
 - Spatial mgt of foraging areas (of preys), spawning areas (of forage), etc.
 - Total set asides forage for non- or minimal harvest

Forage

- Four Recommendations:
 - Consider forage criteria apt to be done for each Council, but need national coordination to ensure consistency
 - Consider reviewing approaches to explore estimating forage B as a group for a system
 - Consider reviewing approaches to explore estimating forage demands for a system
 - Form a national cmte to address Forage issues??
- General considerations:
 - Need adequate forage base, but for what?
 - How to handle spp not in an FMP, or across FMPs?
 - How to link back to legislative mandates (& NS1,2, etc.)

Goals & Objectives

- Key Observation:
 - Establishing ecosystem goals and objectives are critical
 - Everyone agrees they are needed
 - Everyone also agrees they are hard to pin down
 - Scoping is important part of the process
- Typical ways to address:
 - Scoping and stakeholder workshops
 - Unpacking national mandates & general principles
 - Triage and risk analyses of std “checklist”

Goals & Objectives

- Three recommendations:
 - Review and establish a standard “triage list” for RA
 - Continue to engage Councils re their needs and priorities
 - Carefully develop transition strategies
- General considerations:
 - Need to note why EBFM is an enhancement/
improvement over current approach
 - Several, but generally a need to examine things we typically omit and other things that can affect stocks
 - What is under the remit of the Councils, and what is simply broader context?
 - Relation to NS 1, 2 (3, 6, 7, 9)

North Pacific Fishery Management Council – SSC report
2011 National SSC Workshop, Kingsmill, Virginia
October 4-6, 2011

This report provides an overview of the North Pacific Fishery Management Council (NPFMC)'s ecosystem perspective, and a short discussion of current practices and challenges with using social and economic information in a fishery management context.

Overview of NPFMC Ecosystem Perspective

The NPFMC has adopted many actions that comport with an ecosystem-based approach to fisheries management. The Council's policy is *to apply judicious and responsible fisheries management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems for the benefit of future, as well as current, generations.*

In addition to conservative annual catch limits (ACLs) for all managed species, Alaskan region fishery management incorporates a number of other conservation measures. Extensive area and seasonal closures exist throughout Federal waters in and off Alaska, protecting sensitive areas, such as deep sea coral gardens, areas where the risk of encountering bycatch and prohibited species is high, and marine mammal critical habitat. Gear restrictions are also used extensively, especially for bottom-contact trawling, as well as gear modification requirements to reduce adverse interactions. Examples include biodegradable panels on pots, salmon excluder devices in trawl nets, seabird deterrents on longlines, and elevation devices on trawl sweeps. All species or species groups are managed with individual ACLs, and in many cases, bycatch limits are also implemented for species outside of the Fishery Management Plan (FMP). For pollock and Pacific cod, retention requirements also exist to reduce discards and waste. Some other, specific elements of the Council's management approach are highlighted below.

Ecosystem-based management policy

The Council has developed a multi-objective ecosystem policy for its groundfish FMPs. The policy was developed during the course of a comprehensive, programmatic review of the groundfish fisheries in the Bering Sea/ Aleutian Islands (BSAI) and Gulf of Alaska (GOA). Each of the eight policy goals also has a set of specific objectives that further specify how the goal should be implemented. Additionally, the Council periodically develops a work-plan to prioritize actions to implement the policy goals and objectives, and the status of the work-plan is reviewed at each Council meeting. The eight policy goals are:

- Prevent Overfishing
- Promote Sustainable Fisheries and Communities
- Preserve Food Web
- Manage Incidental Catch and Reduce Bycatch and Waste
- Avoid Impacts to Seabirds and Marine Mammals:
- Reduce and Avoid Impacts to Habitat
- Promote Equitable and Efficient Use of Fishery Resources
- Increase Alaska Native Consultation
- Improve Data Quality, Monitoring, and Enforcement

While the SSC is stalwart in its position that it does not recommend policy to the Council, nonetheless the SSC is essential in helping the Council to articulate how a given policy might be conceived, both with respect to ecosystem policy and the use of social and economic information in fishery management.

During the development of the Council's groundfish management policy and programmatic groundfish fisheries review, the SSC provided comments to the Council at every iteration. The SSC did not recommend which of the various policy options the Council should finally endorse, but was nonetheless

integral in helping to incorporate a multi-objective ecosystem approach into the alternatives that called for such an approach, one of which the Council eventually endorsed.

System-level optimum yield

The NPFMC has an established optimum yield (OY) range for BSAI and GOA groundfish FMPs. The OY range for the BSAI was determined when the FMP was first established, in the early 1980s, as 85% of the maximum sustainable yield (MSY) range calculated for the groundfish complex. The groundfish complex includes target species (pollock, cod, flatfish, rockfish, sablefish, Atka mackerel, and squid), as well as four species groups then-categorized as 'other' (sharks, octopus, skates, and sculpins), and MSY was based on average catches of these species from 1968 through 1977. The 15% reduction from MSY was intended to assure the continued health of the target species, and to mitigate the impact of commercial groundfish operations on other elements of the natural environment. The OY range is 1.4 million mt to 2.0 million mt. In the last decade, the 2.0 million mt upper limit has been scientifically reevaluated, and has also been codified in national law.

For the GOA, the OY range was established in 1986, as 116,000 mt to 800,000 mt. The lower end of the range is equal to the lowest historical groundfish catch during the 21-year period preceding the approval of the OY range. The upper end of the range was approximately equal to 95% of the mean MSY for the most recent five-year period, at the time of the amendment for all species of groundfish that supported their own fishery and for which sufficient data existed (pollock, cod, sablefish, rockfish, flatfish, and Atka mackerel).

The NPFMC also has a system-level OY of zero for the Arctic FMP. There are three target species identified for the Arctic FMP (snow crab, Arctic cod, and saffron cod), and an MSY was calculated for each stock. To calculate OY, the MSY values were reduced by the relevant socio-economic factors of uncertainty and costs, as well as relevant ecological factors. For each species, a decision theory calculation was made to reduce the MSY for each stock by a given percentage to account for uncertainty. Because no significant commercial fishery currently exists (nor has existed in recent history) for any of the three stocks to which the plan applies, the expected costs of fishing outweigh the expected revenues, which further reduced MSY to zero. Finally, as Arctic cod is a keystone species in the Arctic, the relevant ecological factors prescribe something close to a 100% reduction from MSY for Arctic cod and saffron cod (the latter of which cannot be targeted without harvesting Arctic cod).

Using ecosystem information in an ACL context

One tactical mechanism to incorporate ecosystem information into stock assessments is to include a quantitative variable into a single species model. This variable might be a predation (M2) variable, or an environmental or habitat variable. For example, in the eastern Bering Sea yellowfin sole stock assessment, the survey catchability variable (q) fluctuates, based on water temperature (i.e., whether it is a cold or a warm year). In another instance, the GOA walleye pollock stock assessment incorporates a B₂₀ threshold, limiting fishing at low biomass levels, as a protection measure for Steller sea lions which prey on pollock.

Ecosystem information can also be incorporated into the annual ACL process in a qualitative way. Since 1995, the Council has had an Ecosystem Considerations Report presented as an appendix to the groundfish Stock Assessment and Fishery Evaluation (SAFE) reports for groundfish management. Over the years, this section has evolved and expanded to include an ecosystem assessment for each region in addition to reporting of ecosystem indicators. Beginning this year, a targeted Ecosystem Considerations report is also being included with the crab management SAFE report.

The groundfish stock assessment authors include a section describing ecological interactions for their species, in each of their stock assessments. These are primarily qualitative in nature and may be used in the annual assessment of whether ABC should be reduced below the maximum allowable. These are also used to identify stocks that are highest priority for multispecies modeling and assessment. Some stock assessments also incorporated ecosystem factors directly into the assessment model. Some species have temperature-dependent factors that shift the selectivity curves and some have age-varying natural

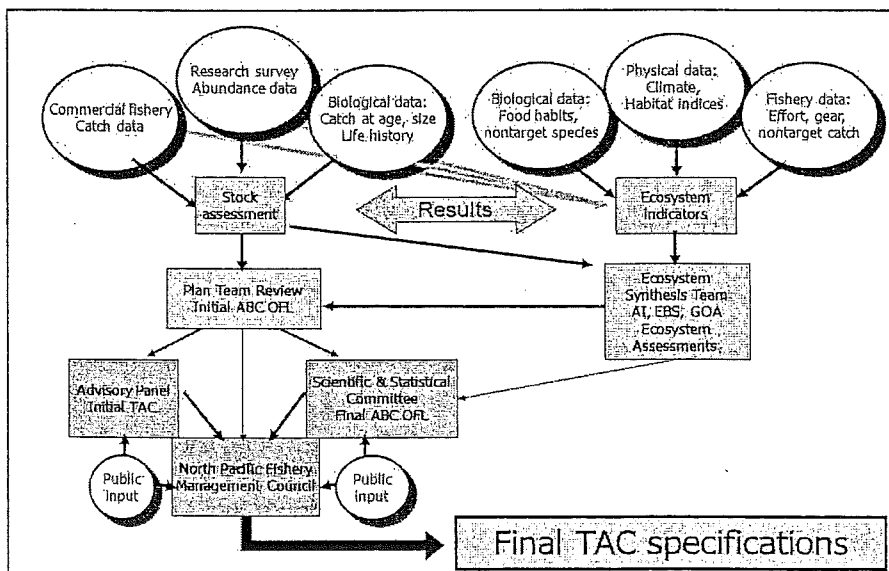
mortality because of age-varying predation mortality. Also, commercially important prey species of the endangered Steller sea lion have more conservative minimum stock size thresholds than other target groundfish species. Moreover, climate regime shifts factor into decisions about what years to select for estimating stock-recruit parameters and MSY.

The annual ecosystem assessment is presented during the groundfish harvest specifications discussions at the Plan Teams, and subsequently at the SSC and Council (Figure 1). Information from that assessment is also available to the stock assessment authors, for direct use in their assessments. A staff member from the ecosystem assessment group at the Alaska Fisheries Science Center sits on each of the groundfish Plan Teams, to provide expertise in the harvest specification discussions. As noted above, the ABC deliberations by the Plan teams and SSC may include consideration of whether there is a trend in natural mortality due to predation or whether there is sufficient forage for a target species that may be exhibiting reduced recruitment trends. This may play a role in deciding whether the ABC should be reduced below the maximum allowable.

An example of how qualitative evaluation of ecosystem information can affect the ACL process is the establishment of the acceptable biological catch (ABC) for Bering Sea walleye pollock for 2008. The Plan Team and the SSC both reviewed the stock assessment, which resulted in a maximum permissible ABC of 1.17 million mt. However, new data indicated that various year classes appeared less strong than they had previously seemed, indicating that forage for pollock might have been reduced. Additionally, related information from the ecosystem assessment indicated a growth in the arrowtooth flounder population, which may be resulting in increased juvenile pollock mortality. Given the uncertainty of these various factors, the SSC recommended extra conservatism, and recommended that the ABC should be lowered to 1 million mt. As part of their deliberations, the SSC considered the economic implications of the ABC reduction, and provided the Council some additional analysis of how the Bering Sea pollock industry would be positioned to weather the projected pollock ABC reductions, and whether the change would be expected to result in wide-spread economic failure and dislocation.

Strategically, other tools can also be used to incorporate ecosystem information into the ACL process. Management strategy evaluations can be used to determine the robustness of management strategies. Additionally, the quantitative suites of ecosystem indicators and aggregate indices that are included in the annual Ecosystem Considerations report can be useful.

Figure 1 Schematic of the NPFMC process for specifying annual catch limits.



Considerations for forage fish

The NPFMC groundfish FMPs have a forage fish category, part of the ecosystem component of the fishery, which identifies species that are a critical food source for many marine mammal, seabird, and fish species. A directed Federal fishery for these species is prohibited, and a catch deterrent requires vessels to discard bycatch amounts that exceed 2% of the target catch they have onboard.

Forage fish category:

- Osmeridae family (eulachon, capelin, and other smelts)
- Myctophidae family (lanternfishes)
- Bathylagidae family (deep-sea smelts)
- Ammodytidae family (Pacific sand lance)
- Trichodontidae family (Pacific sand fish)
- Pholidae family (gunnels)
- Stichaeidae family (pricklebacks, warbonnets, eelblennys, cockscombs, and shannys)
- Gonostomatidae family (bristlemouths, lightfishes, and anglemouths)
- Order Euphausiacea (krill)

Some of the target groundfish species are also important as prey species. These include pollock, cod, Atka mackerel, squid, and others. Sometimes, detailed food habits data and trends are presented in assessments for such stocks to ascertain time trends in natural mortality that may be a concern. Additionally, whereas herring and shrimp are not Federally managed species, they are also important as forage species.

Council activities supporting ecosystem-based approaches to fisheries management

The NPFMC has also adopted several broader-scale efforts to consider an ecosystem-based approach to fisheries management. In 2004, the Council re-constituted its Ecosystem Committee to track national-level ecosystem-related initiatives, and determine whether they are relevant for fishery management in and off Alaska. An idea that had its genesis in the Ecosystem Committee is the Alaska Marine Ecosystem Forum, with a membership of thirteen Federal and State agencies with jurisdiction over marine activities off Alaska. The group meets periodically, to promote dialogue and information exchange about issues of shared responsibilities related to the marine ecosystems off Alaska's coast. The goal of the Forum is to improve agency coordination and allow agencies to understand the ecosystem impact of other marine activities.

The Council also has developed an Aleutian Islands Fishery Ecosystem Plan. The FEP identifies key interactions in the Aleutian Islands that should be monitored by fishery managers, and assesses the risk associated with those interactions, and how that risk is currently addressed by managers. Both available and ideal indicators for these interactions are identified in the FEP, as an indication of priority data gaps and research needs for the ecosystem.

The recent development of the Arctic FMP by the Council was modeled on an ecosystem-based approach, both in its geographic scope and in its ecological basis. The development involved considerable outreach to stakeholders within the Arctic region, as well as fishing industry representatives.

Using social and economic information in fishery management: current practices and challenges

Among the roles served by the NPFMC's SSC is that of reviewing the adequacy of all social and economic analyses, prior to the Council's final decision. The SSC utilizes its scientific expertise to provide technical advice to analysts concerning all FMP and regulatory amendment analyses prior to public review. In 2010, the SSC conducted 13 reviews of amendment analyses, of which the social and economic portions (RIR/IRFA) ranged from 5 pages to 185 pages and averaged 20 to 30 pages. Although most analyses are reviewed a single time by the SSC, with recommendations to be addressed by analysts prior to the release of the document for public review, some analyses require more extensive revisions that require the SSC to review the revised document a second time prior to public release. In instances

when the complexity of an issue may be anticipated or the SSC's expertise is deemed useful for development of alternatives for analysis, the SSC may review discussion papers, analytical outlines, or preliminary analyses. In 2010, the SSC reviewed one analysis a second time and also reviewed four preliminary analyses. The SSC also reviewed four discussion papers, two of which addressed analytical methodologies and two of which addressed data collection. The SSC also reviews the economic portion of the Stock Assessment and Fishery Evaluation report. Moreover, the SSC has conducted occasional workshops to hear and comment on ongoing and planned social and economic studies conducted by NMFS and university scientists related to Council issues and needs.

In reviewing a social and economic analysis, the SSC determines the "adequacy" of that analysis, based upon whether that analysis provides the Council with the best available information to evaluate 1) the expected effects of each alternative on potentially affected groups; 2) the benefits and costs of each alternative (including a summary of the net benefits to the Nation; and 3) the action in relation to the MSA national standards.

The SSC confronts several issues in assessing the adequacy of an analysis. Issues arise disproportionately from two particular limitations. First, analysts often are challenged by the Council to generate analyses in a relatively short period of time. It is not unusual for the Council to request that an analysis of a complex management decision be prepared in just a few months. This time constraint limits the ability of analysts to prepare more complex, sophisticated analyses. In particular, time is not available to develop complex models that quantify the effects of a management action. Second, analyses are often data constrained. In particular, few cost data for economic analyses and minimal social and cultural data are typically available.

In recent years, the Council has been challenged to resolve management issues that affect the distribution of resources among the commercial fishing sector and other interests (including, guide sport fishing interests, and subsistence users). Several issues arise in the development of analyses that contrast these, often, competing interests.

For the commercial fishery sector, data are available to provide quantitative estimates of effects on landings, gross revenues, and prices. These estimates, however, are typically generated using static models that analyze the effects of an action retrospectively. Behavioral changes may be discussed, but are not incorporated into the models. In the available time, it is unlikely that more complex models could be generated. Yet, the reliance on these limited analyses is questionable. A further challenge arises from the dearth of reliable cost data. Without cost data, analyses cannot quantitatively examine net effects on the commercial fishery sector, which are critical to understanding the true effect of the action. Similarly, community effects are also typically analyzed through economic and social profiles that provide a historical 'snapshot' of the community.

Limited quantitative information is available concerning interests other than commercial fisheries. Recreational and subsistence harvests are poorly documented. In addition, extensive modeling is needed to develop quantitative estimates of effects and impacts that may be compared to commercial fishery effects and impacts. Biological uncertainties compound these challenges. For example, development of measures to compare the potential societal benefit derived from an uncertain recovery of an endangered species, with additional costs associated with commercial fisheries area closures, juxtaposes two substantial analytical challenges. Recently, a greater analytical challenge has arisen in connection with proposed management measures to establish a limit on Chinook salmon prohibited species catch in commercial trawl fisheries, in part, to protect subsistence fishing interests, which could arguably require analysts to value the subsistence lifestyle benefit derived from potential increases in Chinook salmon returns. In such a circumstance, the SSC must evaluate whether qualitative analyses adequately inform decision making, concerning the effects of the action (including the net benefits to the Nation).

Two specific examples shed light on the challenges faced by SSC's efforts to address these challenges. The first example is the crab economic data reports (EDR), a Congressionally mandated data collection program, implemented simultaneously with the implementation of a catch share program in the Bering Sea and Aleutian Islands crab fisheries. The program's objective is to collect comprehensive economic

data (most importantly cost data) to allow more comprehensive analyses of the crab fisheries and the effects of the catch share program. Since its outset, there have been discussions about the utility of the program. These have included questions about the accuracy and consistency of the data, particularly cost elements that must be estimated or prorated across fisheries that may have different operational structures. It has been acknowledged that some of the collection is redundant with other programs, which request similar (but not exactly the same) data. Costs of the program to both industry and the agency could also be reduced. The time for a submitter to complete a form is estimated to be approximately one week, annually. Agency costs are also substantial, as the cost of administration of the program has exceeded quota management costs in some years. These concerns have led the Council to consider revising the program, with alternatives that scale back the collection substantially. There is an ongoing discussion in the Council concerning the appropriate scale of economic data collection programs for fisheries analyses.

A second example arises from the development of a catch sharing plan, to apportion the available halibut resource between the commercial fishery and the guided sport (charter) fishery. On its face, such a division requires analysts to examine the relative impacts of the two sectors on local and regional economies. The different industry structures affect local communities and economies very differently. In addition, analysts must develop estimates of demand for charter services under various proposed bag limits and size limits. A considerable challenge also arises from the need to assess the price effects of a provision allowing charter operators to supplement their operations by acquiring individual fishing quota from the commercial sector. Each of these considerations alone poses a substantial analytical challenge.

The NPFMC's SSC will continue to face this tension between the need for additional data and modeling, on one hand, and the need for timely management actions when providing scientific expertise and technical advice to analysts, on the other. While integrating more sophisticated models into analyses might improve social and economic information to decision makers, the development of such models for examining the effects of an action would often substantially delay the action. A further challenge arises in the development of quality sources of economic and social data, needed to support analyses. The SSC will continue to endeavor to provide leadership and expert guidance to further the Council's understanding of the scientific basis for, and implications of, management actions under consideration.

New England Fishery Management Council
Scientific and Statistical Committee
Update for 2011 National SSC Meeting
4-6 October 2011
Williamsburg, VA

Since the last National Scientific and Statistical Committee (SSC) meeting, the New England Fishery Management Council (NEFMC) appointed a number of new members to their SSC, increasing the size of the committee to eighteen. The appointments were made in three groups of initial terms lasting from one to three years, with the intention of future appointments all lasting three years. This will facilitate an orderly transition and turnover on the SSC, while maintaining institutional knowledge within the group.

Given the focus of this National SSC meeting on ecosystem and socioeconomic issues, these topics will be highlighted in this update. Additional information is provided regarding recent activities related to Acceptable Biological Catch (ABC) uncertainty, a new process being implemented this winter to address update assessments, and the forming of a risk policy team.

At the request of the Council, the SSC developed a white paper on possible pathways toward ecosystem-based fishery management (EBFM) in the Northeast. This white paper was presented to the full Council three times during development: November 2010, February 2011, and April 2011. The final white paper describes ecological production units as possible management units to replace the current stock centric Fishery Management Plans (FMPs) and a transition strategy to move from the current management system to full EBFM. The paper describes an eight step process to implement full EBFM and the principal elements of the scientific approach to be used in the region.

At the September 2011 Council meeting, a strategy was outlined to develop EBFM in three phases. The first phase consists of establishing goals and objectives. Included in this phase is the definition of the specific ecosystem production units (EPUs) which will serve as the basis for management units. The second phase identifies management and scientific requirements to implement EBFM in the region. For example, the Northeast Multispecies, Skate, and Monkfish FMPs could be combined into a joint plan to account for biological interactions. This would require definition of new reference points based on new modeling efforts for the species complex. The third and final phase implements EBFM using quota-based management in all ecosystem production units. This requires allocating all fishery resources to each EPU. The many details of accumulation limits, transferability requirements, permitting, and monitoring requirements would all need to be defined. An environmental impact statement would be developed for the new plan during this phase as well. These phases would last one, two, and three years, respectively, for a total implementation time of six years.

There were no specific social science terms of reference this past year. However, with the addition of three new social scientists to the committee, there is expected to be increased attention given to a number of issues in the coming year. Specifically, risk and ABC buffers,

management strategy evaluations (MSE), the mixed stock exemption, and socioeconomic aspects of ecosystem based fishery management are all expected to be considered.

Currently the NEFMC does not have a general control rule to deal with risk. The risk policy team, described below, will be working to develop such a rule or process for addressing risk concerns. The Council decided that rules would be specific to different Fishery Management Plans (FMPs) to allow for specific factors within each FMP to be addressed directly. For example, in the Northeast Multispecies FMP, which covers 20 groundfish stocks, the default control rule is to use 75% of Fmsy when calculating ABCs to account for uncertainty. This is a simple and easy to apply control rule, but ignores the different amounts and types of uncertainties in the 20 stock assessments.

Risk considerations were explicitly raised by a report of the Massachusetts Fisheries Institute (MFI), which states that "Scientifically valid alternative reference points have been identified which can trigger increases in annual catch limits (ACLs) without sacrificing conservation." The SSC was tasked with reviewing this report and concluded "the information in the MFI report does not justify revision of the ABCs recommended by the SSC and adopted by the Council." However, the SSC acknowledged that the MFI report raised some issues that deserved consideration in the future, as seen in the following quotes from the SSC review report regarding MSE and the mixed stock exemption.

- The implicit management strategy described by NS1 Guidelines should be subjected to a Management Strategy Evaluation (MSE) designed to accommodate the range of assessment and management situations confronted. The MSE should consider performance in terms of biological, economic and social impacts. Further, the SSC recommends that the Council consider additional social and economic information in the development of ABC control rules and in setting ABCs (rather than relegated to secondary impact analyses). Such an evaluation would also identify potential problems of misspecification or inconsistencies in the Guidelines. While this is a significant research undertaking, it is both critically important and achievable.
- The mixed stock nature of NE groundfish and many other fisheries is a reality. Preventing overfishing of each individual stock in a mixed stock fishery is likely to result in forgone yield and potentially loss of net benefits to the Nation. In order to mitigate potential losses while maintaining safeguards to prevent irreversible damage to any individual stock, scientific analysis of the biological, economic, and social dimensions of the mixed stock exemption should be explored.
- The SSC recommends that the reasons for the unharvested commercial ACLs be explored.

As noted above, there is a large role for social scientists in ecosystem based fishery management. Virtually all definitions of marine EBM share at least three common elements: (1) a commitment to establishing spatial management units based on ecological rather than political boundaries, (2) consideration of the relationships among ecosystem components, the physical environment, and human communities, and (3) the recognition that humans are an

integral part of the ecosystem (NMFS EBFM brochure). The NEFMC SSC is well positioned to fulfill this role with the new social scientists on the committee.

During this past year, the NEFMC SSC has been tasked with addressing uncertainty when recommending acceptable biological catches for a number of stocks. The SSC has met with the plan development teams (PDTs) to provide methodological guidance on how to best address uncertainty in each situation. These interactions have been productive and informative to both groups. For the skate complex, a new discard mortality rate was used in both the stock assessment and the calculation of ABC. The need to consistently apply the same rate throughout all the calculations was clearly demonstrated in this case.

For the whiting stocks (red hake, silver hake, and offshore hake), the review panel rejected all analytical assessments, so no risk analysis was possible. This is because the trade-offs between future catches and changes in stock abundance could not be estimated. Instead, the uncertainty in the overfishing limit was characterized by the uncertainty in both the survey abundance and relative Fmsy. The ABC was then calculated for a range of risk tolerances relative to the probability of overfishing. These calculations led to ABCs which were much larger (5-9 fold) than recent catches. The SSC advised that a gradual increase in catch would be preferred to a large sudden increase in catch.

For the groundfish stocks in the Northeast Multispecies FMP, the PDT was augmented with additional members to address concerns about medium-term (5-7 years) projections. The augmented PDT conducted a number of simulation studies examining the performance of projections starting at earlier points in the recent assessments (retrospective peels). The results indicated that uncertainty in the initial population abundance at age estimates combined with incorrect future recruitment assumptions and changes in mean weights and selectivity at age caused poor performance of these medium-term projections. This led to the need for update assessments because the medium-term projections were not deemed sufficiently reliable to set ABCs.

The new update process for stock assessments will be applied this winter to twelve groundfish stocks which were last assessed in GARM III, which was held in 2008. The process has an assessment oversight panel consisting of the chairs of the NEFMC and MAFMC SSCs (or their delegate if the chair is a NMFS employee) and a senior stock assessment scientist from the Center. These three individuals will review plans provided by the NMFS lead scientists on how they will update the assessments. The key feature of these plans is the sequence of fallback positions if the standard "turn-the-crank" update fails for any reason. These fallback positions will only be examined as necessary. These update assessments will have reduced terms of reference and documentation requirements compared to the standard review process. It remains to be seen how the opposing needs of speed, openness, transparency, and inclusiveness are balanced.

Finally, the need for a risk policy team to address overarching questions regarding management under the new MSA has become apparent. This team is still being formed but will include

representatives from the Council, SSC, Council staff, Science Center, and Regional Office. The team will examine trade-offs between different types of risk, to both the stock and the fishery. This will require a holistic approach to address issues ranging from data collection to estimation of uncertainty to implementation of management actions. However, as noted above, the team is not expected to create a single rule to be applied to all FMPs, but rather a set of guiding principles that will be interpreted for each specific FMP.

PFMC summary for 2011 National SSC workshop

ACL implementation

The Pacific Fishery Management Council has adopted a "P-star" approach for stocks managed under its Coastal Pelagic Species and Groundfish FMPs. Acceptable biological catches (ABCs) are based on an evaluation of scientific uncertainty by the SSC in the form of a value for σ , the scale parameter for a log-normal distribution, and a P^* selected by the Council to reflect its policy decision on risk. This approach has the advantage of having clearly delineated roles for the SSC and the Council, and avoids the back-and-forth negotiating that accompanies the use of arbitrary buffers to account for scientific uncertainty (e.g., $ABC = 0.75 \text{ OFL}$). Three categories of stocks, data-rich, data-moderate, and data-poor, are assigned increasing values of σ to reflect the greater uncertainty of data-poor assessments.

The OFLs recommended by the SSC for the 2013-14 management cycle were adopted by the Council at the September 2011 meeting. For most stocks, the Council elected to use the same P^* as in the previous management cycle to establish the ABC. The Council exercised its policy prerogative by selecting species-specific P^* s for sablefish and spiny dogfish, reflecting its intent to manage these stocks with greater precaution.

In May 2011, a data-poor methods review panel reviewed and endorsed both Depletion Corrected Average Catch (DCAC) and Depletion Based-Stock Reduction Analysis (DB-SRA) as appropriate methods for obtaining OFLs for data-poor stocks. In June 2011, the Council adopted the ACL amendment to the Salmon FMP, and is currently awaiting secretarial approval. Nearly all salmon stocks are exempt from the ACL requirement because either they are managed under the Pacific Salmon Treaty, listed under the ESA, or are hatchery stocks. ACLs were required for only two salmon stocks. Alternative approaches needed to be developed due to unique aspects of salmon biology and management. For example, OFLs and ABCs were defined in terms of projected spawning escapement, rather than as annual catch amounts.

Several workshops being planned for next year by PFMC as off-year groundfish science improvements. These include an assessment methods review panel to evaluate simple assessment techniques for data-moderate stocks, and a workshop to review B_0 -based reference points used in harvest control rules and for status determination. SSC is also considering ways to improve specification of scientific uncertainty, for example by setting stock-specific σ s for data-rich stocks, and by using MSE modeling to evaluate the appropriate level of scientific uncertainty (σ) for data-poor groundfish stocks.

SSC Subcommittees

Much of the SSC's work is done by standing subcommittees that hold separate meetings for review of subject area analyses and to develop science recommendations. The SSC maintains subcommittees for each FMP (salmon, groundfish, coastal pelagic species, highly migratory species), and economics and ecosystem based management subcommittees. SSC members typically belong to two or more subcommittees. Reports developed by subcommittees go to the full SSC for review and endorsement. Ecosystem Based Management Subcommittee was initially established as the Marine Reserve Subcommittee to address scientific issues associated with the Channel Islands National Marine Sanctuary marine reserve initiative. The EBM

subcommittee is the largest subcommittee of the SSC, and includes nine members out of the total SSC membership of seventeen. The subcommittee includes economists, marine ecologists, and stock assessment experts, which enables it to bring a broad range of expertise to bear on ecosystem-related issues. The Economics Subcommittee presently consists of two economists and two quantitative biologists with some expertise in economics.

Ecosystem-Based Fisheries Management Initiative

Council launched a major EBFM initiative in 2009, and established an Ecosystem Plan Development Team and an Ecosystem Advisory Subpanel to guide the plan development process. The EPDT consists of scientists and policy analysts from NMFS, and state and tribal agencies, while the EAS includes representatives from stakeholders groups and the general public, including both fishing industry representatives and conservation organizations. Based on Council direction, the initial focus of the EPDT was on developing a purpose and need statement and considering the regulatory scope of the plan. In addition, several presentations were scheduled to inform the Council on ecosystem-based management issues, including a presentation by the chair of North Pacific Council SSC on ecosystem-based management in the North Pacific, and a presentation by the developers of California Current Integrated Ecosystem Assessment.

SSC has given advice on ecosystem based management to the Council in a number of areas, but has attempted to avoid making policy recommendations. The SSC has tried to clarify issues, and suggested the next steps and questions to be addressed by EPDT. The SSC has also recommended specific ways of incorporating ecosystem science into the Council process, and discussed review processes needed for ecosystem science tools and products.

The Council has generally taken a deliberative approach to adopting ecosystem-based management, and considers EBFM an evolutionary process rather than a revolutionary process. Potential changes in management under EBFM should provide tangible benefits in achieving Council responsibilities under MSA to sustainably manage fisheries resources while protecting marine ecosystems. The Council is already doing many things generally regarded as EBFM, such as closing areas to various types of bottom contact fishing gear under Essential Fish Habitat provisions, using environmentally-based run size forecasts and harvest control rules, implementing bycatch restrictions to rebuild overfished groundfish stocks, and instituting a ban on krill fishing

In June 2011 the Council approved the draft purpose and need statement as proposed by the Ecosystem Plan Development Team (EPDT) and moved to develop an ecosystem plan that is primarily advisory in nature with the potential for expanding the plan to include regulatory authority in the future. It also recommended continued management of stocks and fisheries through existing fishery management plans. The Council will consider additional management measures for forage fish species as is deemed appropriate. The Council's purpose statement is as follows: "The purpose of a Fishery Ecosystem Plan (FEP) is to enhance the Council's species-specific management programs with more ecosystem science, broader ecosystem considerations and management policies that coordinate Council management across its FMPs and the California Current Ecosystem (CCE). A FEP should provide a framework for considering policy choices and trade-offs as they affect FMP species and the broader CCE."

Socioeconomics Analysis and Review

Socioeconomic analyses are reviewed either by the full SSC or by the Economics Subcommittee. Review topics have included: a) socioeconomic data collection programs, b) economic models used for impact analysis, c) socioeconomic analyses in NEPA documents, and d) bycatch projection models with implicit fleet dynamics (joint with Groundfish Subcommittee). Recently there has been an effort to identify and review the components of a regional impact model used to evaluate economic impacts of alternative groundfish management options (Figure 1).

Although the Council routinely uses the SSC for review of economic analyses, several long-standing problems with the review process have been identified. First, economic analyses often appear for review by the SSC as near final drafts, providing little opportunity for revision. Reviews are often combined with, and are subordinate to, review of associated non-economic analyses. Finally, there is no formal review process with Terms of Reference, unlike the STAR-process for stock assessments, or the annual methodology review process for salmon management models. These shortcomings have been recognized, and potential improvements to the review process are under consideration.

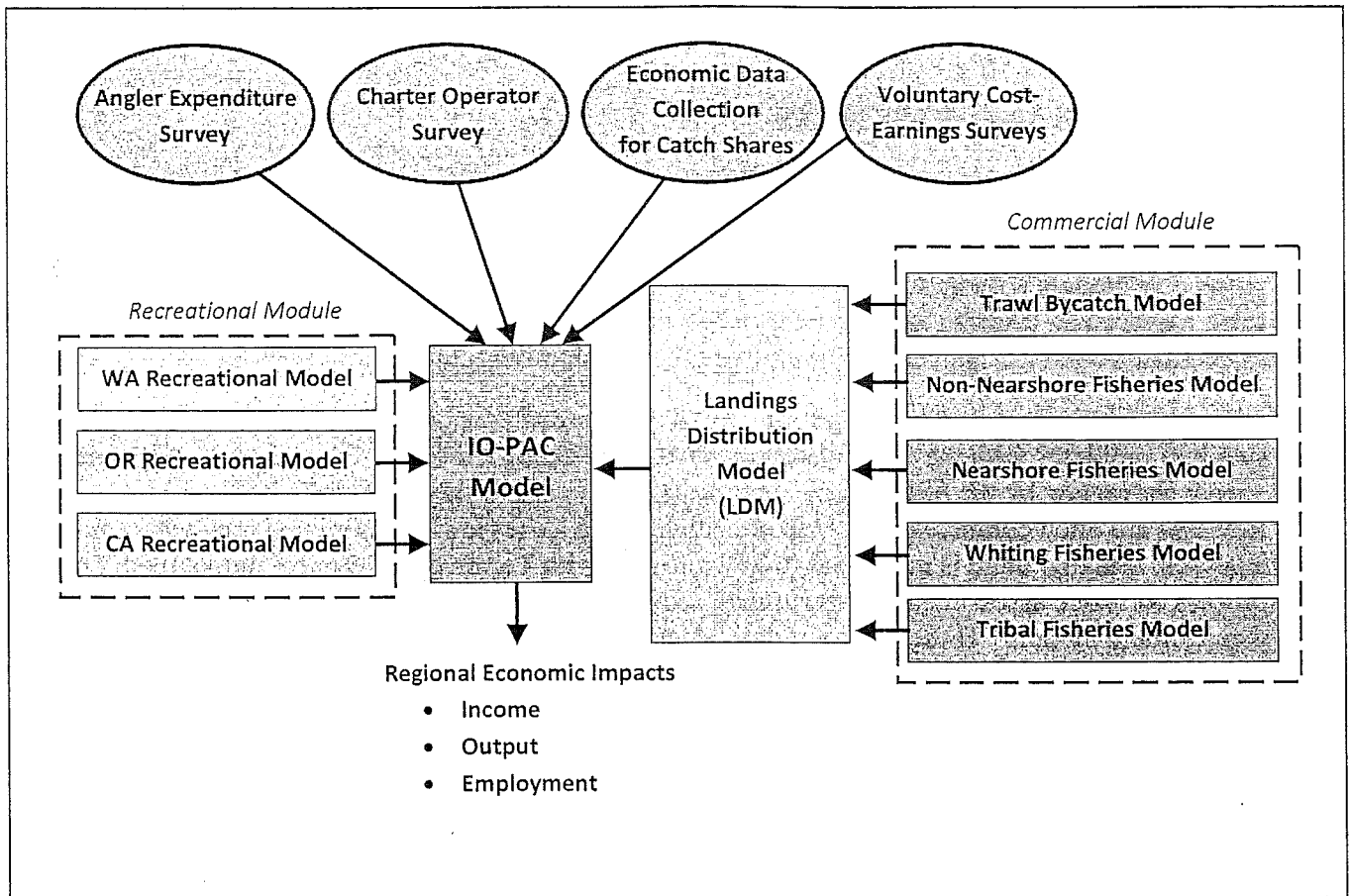


Figure 1. Schematic of the regional impact model used by the Pacific Fisheries Management Council to evaluate economic impacts of alternative groundfish management options.

Mid-Atlantic Council - Priorities 2012 (DRAFT)

Amendment 3 to Spiny Dogfish

Amendment 14 to MSB

Amendment 15 to SC/OQ

Amendment 17 to SF/SC/BSB

Amendment 6 to Monkfish

Annual Specifications

-SF/SC/BSB

-MSB

-SC/OQ

-Tilefish

-Bluefish

-Dogfish

Fishery Performance Reports for all species

SMZs for Delaware Reefs

RSA Program Review Completion and implementation

Scup allocation analysis, review, and consideration

Visioning Project

-Review Visioning Document

-Develop Strategic Plan

Ecosystem Based Fishery Management Planning

Advisory Panel Governance Workgroup - report and implementation

Develop Comprehensive Research Priority Plan



Communications

- develop comprehensive communications plan
- Complete web redesign
- Twitter/Photo library
- online newsletter

Ecosystem and Ocean Planning

- Develop/Implement Committee Project
- CMSP, BOEM, Deep-Sea Corals, MACOORA

SSC Meetings

Vessel Baseline Regulations - Possible Consistency Amendment

Complete Voices of the fisheries project

Other

- MREP
- ACCSP
- MRIP
 - Wave 1 Sampling project
 - Volunteer Angler survey workshop
 - Online workshop to improve for hire registry
- PMAFS
- Chesapeake Bay Goal Implementation Team
- Specifications Concision Workgroup
- NRCC Operational Assessment and ACL working groups
- Protected Resources Take Reduction meetings
- SBRM redo