North Pacific Fishery Management Council – SSC report

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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 B_{20} 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

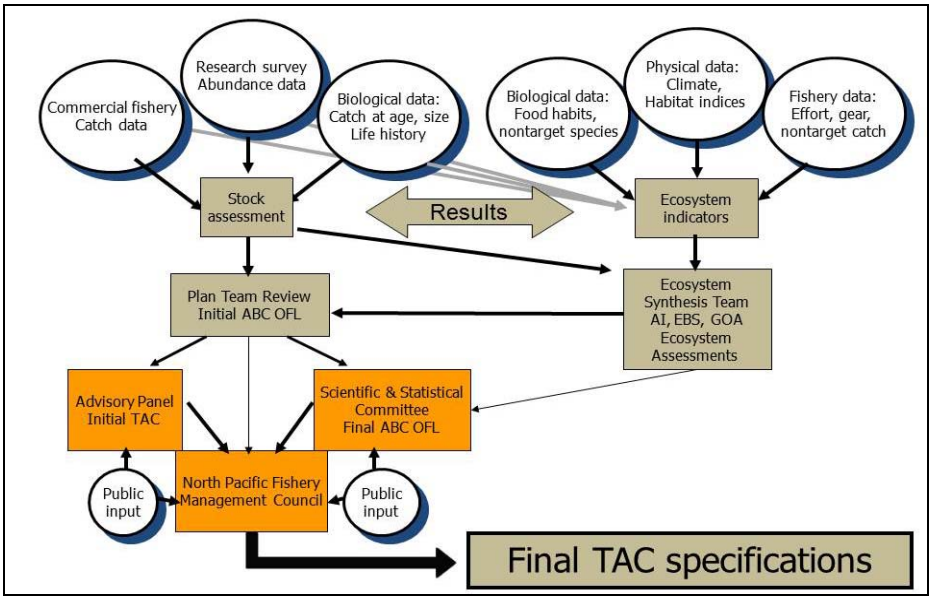
mortality because of age-varying predation mortality. Also, commercially important prey species of the endangered Steller sea lion have more conservative minimum stock size thresholds than other target groundfish species. Moreover, climate regime shifts factor into decisions about what years to select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