Bering Sea Fishery Ecosystem Plan Discussion Paper

January 2014[1]

1 Introduction

In June 2013, the Council tasked staff with a discussion paper on the development of a Bering Sea Fishery Ecosystem Plan (FEP). The motion was put forward in the context of an agenda item relating to the Bering Sea canyons, and a Council request to better understand the importance of these canyons, especially Pribilof and Zhemchug canyons, as part of a highly productive shelf break zone providing coral and sponge habitats for fish and crab species. In recognition of the Council's immediate focus on the Bering Sea slope, the Council's Ecosystem Committee originally recommended that the Council consider development of an FEP specifically for the slope area, however the Council ultimately broadened the scope of the discussion paper so as to allow the discussion to dictate the appropriate geographic scale for a potential FEP.

This discussion paper provides some background on the development of the Council's existing FEP, for the Aleutian Islands ecosystem area, as well as the availability of information about the Bering Sea ecosystem. The paper also identifies that if the Council chooses to proceed, a key consideration will be to define a management objective for a potential Bering Sea FEP, in addition to considering the geographical scope and logistical approach to such a project.

2 Experience with FEP development

In 2005 to 2007, the Council developed and adopted an Aleutian Islands Fishery Ecosystem Plan (NPFMC 2007a). The goal of the AI FEP was "to provide enhanced scientific information and measurable indicators to evaluate and promote ecosystem health, sustainable fisheries, and vibrant communities in the Aleutian Islands region". Through the AI FEP, the Council experimented with the concept of FEPs, to see whether they could be a useful tool for fishery management. The Council purposely selected the Aleutian Islands ecosystem area because it is the least predictable of the ecosystems in which the Council manages, and therefore the Council might be in need of non-traditional tools. Additionally, the AI is managed jointly with the Bering Sea for groundfish, and the Council wanted to consider whether area-specific management was warranted. Five specific purposes for the FEP were identified:

a. to integrate information from across the FMPs with regard to the Aleutian Islands, using existing analyses and reports such as the Groundfish PSEIS, the EFH EIS, and the Ecosystem Considerations chapter
   NOTE: this integration should be user-friendly, i.e., short, simple, and avoiding redundancy
b. to identify a set of indicators for the Aleutian Islands to evaluate the status of the ecosystem over time
c. to provide a focal point to develop and refine tools, such as ecosystem models to evaluate the indicators
d. to identify sources of uncertainty and use them to determine research and data needs

[1] Prepared by: Diana Evans, Council staff.

e. to assist the Council in (1) setting management goals and objectives, and (2) understanding the cumulative effects of management actions

The FEP was written by an interagency team, the Aleutian Islands Ecosystem Team, appointed by the Council. Members represented various scientific disciplines and different agencies (although most members were from NOAA, and especially the Alaska Fisheries Science Center). The Council's initial invitation letter suggested that the time commitment would be for approximately ten work days over the period of a year, including two team meetings. In actuality, most of the participants invested considerably more of their time on the project.

The resulting document successfully described and synthesized the main ecosystem processes and interactions in the Aleutian Islands ecosystem, using available information from multiple sources. The document provides an understanding of the AI ecosystem by highlighting historical perspectives, and the physical, biological, socioeconomic, and management relationships of the area. A qualitative ecosystem risk assessment then identifies key ecosystem interactions relevant for fishery management, and how risk associated with these interactions is currently addressed by managers. A discussion of what else might be done to address any risk, the indicators that could be used to monitor the interactions, and priority data gaps and research needs are also identified. As a companion to the ~200 page FEP, the team prepared a 'glossy' overview of the AI FEP (NPFMC 2007b), which summarized the key information in ~20 pages. Information in the overview pamphlet has been widely shared among stakeholders and further afield.

As described above, the FEP began the process of filtering useful indicators for the AI ecosystem, relating them to the key interactions identified in the document. This work was continued by the AFSC, with participation by the AI Ecosystem Team, after the FEP was adopted, and has been used to develop an AI ecosystem assessment as part of the annual Ecosystem Considerations report. A key finding of the FEP is that interactions and relationships within the AI area are clearly distinct from neighboring systems of the Bering Sea and Gulf of Alaska, and that this should be recognized in fishery management. Information synthesized in the FEP has been used by the Council in some discussions of area specific stock assessment, or other analyses (most recently, the Steller Sea Lion EIS). The FEP also highlighted the influence of non-fishing activities on the AI ecosystem, and the Council's development of the Alaska Marine Ecosystem Forum, as a venue to communicate with other agencies about issues affecting the marine ecosystem, was partially driven by discussions generated by the AI FEP.

The FEP was, however, consciously designed as a guidance document and resource to the Council, rather than a document with legal standing, such as a fishery management plan (FMP). The intent was that all management actions would continue to be analyzed through the regular Council process, but would be informed by the FEP. The document was intended to provide information to the Council process at every level: stock assessment scientists, FMP teams, the Council's SSC and Advisory Panel, and the Council itself. In practice, information from the FEP has been used in an ad hoc fashion, largely at the instigation of members of the interdisciplinary team in their other work. The FEP design purposely omitted an avenue leading to direct management action, and much of the discussion by members of the Aleutian Islands Ecosystem Team since its adoption has been about how to improve the relevancy of the FEP in the management process.

Other Councils have taken a different approach with respect to their FEPs. The most recent Council to develop an FEP is the Pacific Council, for the Pacific Coast. In some ways, the structure of this document is very similar to the AI FEP. The Pacific Coast FEP relies on scientific information from the NOAA Integrated Ecosystem Assessment of the California Current, which is synthesized to provide an understanding of the state of the ecosystem, as well as the connectivity of different processes, in order to assess how change will affect different ecosystem components. The FEP also includes Council priorities for the ocean, with respect to non-fishing activities that occur in the ecosystem, and aims to improve the

process for bringing ecosystem information to the Council both in stock assessments and through ecosystem indicators.

The main difference of the Pacific Coast FEP from the AI FEP is that the Pacific Coast FEP includes an additional "Ecosystem Initiatives" section, packaged as a standalone appendix to the FEP. The purpose of the ecosystem initiatives is for the Pacific Council to identify immediate and future actions to implement the FEP, and review them on an annual basis with respect to progress. The initiatives are intended both to capture cross-FMP issues as well as conservation and management measures within a single FMP.

3 Availability of ecosystem information on the Bering Sea

Unlike the Aleutian Islands, the Bering Sea is the North Pacific Council's most well-studied ecosystem area. There are many conferences, research projects, books, special editions, and articles that have focused on Bering Sea ecosystem processes. One excellent resource for a synthetic understanding of the Bering Sea ecosystem is the PICES publication, "Marine Ecosystems of the North Pacific Ocean," which provides a holistic view of regional ecosystems, based on a five-year time period (PICES 2004, McKinnell and Dagg 2010). Last updated for 2003 to 2008, the Bering Sea chapter (Hunt et al 2010) describes the status of the ecosystem in the context of both the most recent 5 years as well as longer trends, and provides a detailed yet accessible overview of the ecosystem, including the physical ocean and atmosphere as well as all trophic levels.

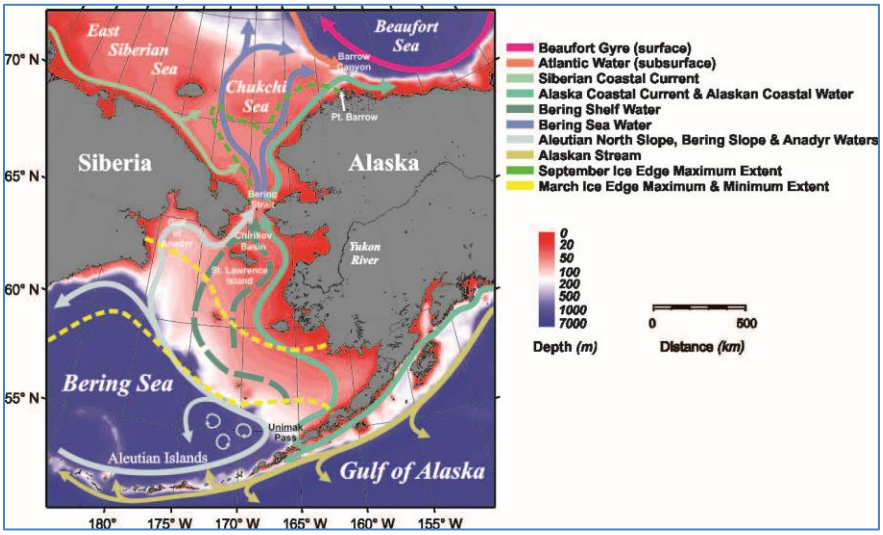
More recent information on the Bering Sea ecosystem comes from the Bering Sea Project[2]. The 2007-2013 research project focused on identifying the mechanisms sustaining the Bering Sea ecosystem, and how they may be impacted by climate change and reduced sea ice cover. Collaborators on the project are in the process of publishing results from their findings, including various articles that synthesize the impacts of climate change at an ecosystem level (e.g., Coyle et al 2011, Hunt et al 2011). A particularly useful resource for the Council will be a series of "Bering Sea Headlines", two-page summaries of each of the papers resulting from the project, which synopsize findings as well as the "big picture" context of the research. Several of these "headlines" are already available on the NPRB website[3], and a magazine of all of the summaries will be published this year.

One of the discussion items for the Council in initiating this paper was the appropriate geographic scale at which to consider developing a Bering Sea FEP. Sigler et al (2011), in a paper resulting from the Bering Sea project, identified three different regions in the Bering Sea. The southern and central Bering Sea regions together form a distinct, subarctic biogeographic province, identified as the Eastern Shelf Province (the eastern Bering Sea shelf, south of Saint Lawrence Island), and the area to the north of Saint Lawrence Island is part of an entirely different biogeographic province. The influence of the cold pool distinguishes the central and southern Bering Sea regions, as in the south it is annually variable, and in the central region bottom temperatures do not vary much from year to year. The boundary between the southern and central Bering Sea region follows the line of minimum ice extent in March (Figure 1), and in the paper was estimated at approximately 60° N. latitude, although it may bend northwards towards the outer shelf. The fisheries mostly occur within the southern Bering Sea region, which also includes the whole of the Bering Sea slope area.

Another product of the Bering Sea project is a module on management strategy evaluations (MSEs), to examine the impacts of climate variability on harvest strategies for different Alaska species. This work is currently ongoing, and results may be available to the Council within the coming months.

[2] A partnership between the North Pacific Research Board's Bering Sea Integrated Ecosystem Research Project and the National Science Foundation's Bering Ecosystem Study.
[3] http://www.nprb.org/bering-sea-project/explore-the-science/project-highlights

Figure 1 **Idealized schematic of the Bering, Chukchi, and Beaufort Seas, denoting important water masses and currents that impact regional differences in physical habitat characteristics. Note, upper yellow line depicts the minimum ice edge extent in March.**



Source: Seth Danielson and Tom Weingarten, in Sigler et al (2011).

Another resource for the Council on Bering Sea ecosystem information is the annual Ecosystem Considerations chapter, and the Bering Sea ecosystem assessment (Zador 2013). One of the goals of the AI FEP was to develop ecosystem indicators for the area. For the Bering Sea, this has already been achieved through a similar process, bringing together an interdisciplinary synthesis team, identifying the structuring theme of the ecosystem assessment (production), and focusing on broad, community-level indicators of ecosystem-wide productivity, which would be most informative for managers. Additionally, the Ecosystem Considerations report provides detailed descriptions on ecosystem status and management indicators, tracked over time.

Other studies have focused on the potential impacts of opening the Arctic, and an increase in transportation through Bering Strait. The 2009 Arctic Marine Shipping Assessment was commissioned by the Arctic Council to address this question, and there have been periodic progress reports to update the assessment since then[4]. The Aleutian Islands Risk Assessment project[5] also tracks the potential increase in Arctic shipping, which also affects the Aleutian Islands, and has developed a number of risk reduction strategies in the follow-up to its 2011 report (AIRA 2011).

4 Questions for Council consideration

There are several questions that suggest themselves, if the Council wishes to consider moving forward with development of an FEP for the Bering Sea. The most important of these is determining the objective of the FEP; other questions relate to the intended geographical scope of the FEP, and the logistics of the project.

The management objective(s) of a BS FEP would likely be different than those the Council identified for the Aleutian Islands FEP, in 2005. That project had multiple objectives: to synthesize information available across many sources; to highlight important ecosystem considerations for an area that is often dwarfed in importance by its larger, more productive neighbor; to develop ecosystem indicators and new research tools and models; and to identify research needs and data gaps. The AI FEP was also a pilot

[4] http://www.pame.is/amsa
[5] http://www.aleutianriskassessment.com/

project, and the Council was testing the waters to see whether the vehicle of an FEP was one that would be useful, without committing itself, at the outset, to a particular course of action as a result of the experiment.

For the Bering Sea, there is already a large body of information available describing ecosystem processes. The recent completion of the Bering Sea Project has added a wealth of new information, much of which focuses on the resiliency of the ecosystem with respect to a changing climate. There are also ongoing transportation and other studies about the effects of increased access to the Arctic. Ecosystem indicators have been refined for the Bering Sea ecosystem to focus specifically on information relevant to fishery managers, and these are presented to the Council annually. Much effort has been devoted to developing models and other analytical tools through the Bering Sea Project work, which has also helped to identify where there are research needs.

Given this, how might a Council FEP for the Bering Sea provide added value? The additional element that the Council might bring to such a document could be to use the FEP to direct specific management action, of some kind. This would be a departure from the Council's guidance for the development of the AI FEP, and would be more in keeping with the concept of the Pacific Council, in their Pacific Coast FEP "Ecosystem Initiatives" appendix.

In June 2013, the Council expressed interest in potentially using the FEP to develop strategies to further understand and address climate change. One focus for the BS FEP could be to assess options for Council action in response to potential impacts from an increase in non-fishing activities, such as marine transportation, in key areas for BS fishery production. For example, the Ecosystem Committee discussed a proposal for food security closures to non-fishing activities at their September 2013 meeting[6]. The FEP might employ tools to identify key fishery resource areas, and a range of Council options for mediating impacts as they might arise.

A different purpose for an FEP could be to develop a Council response to ongoing Bering Sea Project work with management strategy evaluation. Although the work has yet to be completed, the modeling aims to evaluate tradeoffs among different management control rules under alternative climate scenarios. Once the models are fully developed, they might also be used to assess other Council questions about the resiliency of management strategies in the face of climate change. In the FEP, the Council could then formulate different response strategies which might be employed based on prevailing conditions.

One benefit of an FEP is that it provides a broad perspective on activities within the ecosystem region. The Council may have an interest in further examining management tradeoffs from an ecosystem perspective; potentially tradeoffs among fisheries (FMPs or other), or with other activities in the ecosystem. A BS FEP might be a vehicle to facilitate that examination.

One successful outcome of the AI FEP was the communication of the project's findings through the distribution of a glossy overview. In their September 2013 minutes, the Council's Ecosystem Committee recommended considering ways to improve communication of new developments in ecosystem science at the AFSC to the Council and constituents. If one of the Council's management objectives for the BS FEP were to improve science communication, there may be a way to design an FEP that would help facilitate this task.

A different consideration for the Council is what the geographical scope of a BS FEP should be. This discussion paper was initiated in the context of an agenda item addressing BS canyons, and in response to an Ecosystem Committee recommendation to consider developing an FEP for the BS slope. Research

[6] http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/EcosystemCmteWkshopMin9-1617-13.pdf

suggests that the ecosystem region that encompasses the majority of Council fishing activity, as well as the majority of the slope area, is the southern region of the Bering Sea, defined loosely as the area below 60° N. latitude. There does not appear to be evidence to suggest that the slope area is a unique ecoregion within this larger area[7]. The Council would need to decide, based on its management objectives, whether the FEP should focus on this southern region, or should also encompass other regions of the Bering Sea.

The Council should also consider what the logistics of developing an FEP might be. Depending on the Council's management objectives, and the resulting design of the FEP, the resources necessary to develop the project could be considerable. It was the experience of the AI FEP team that the initial estimation of time involved in developing the FEP far underestimated the actual time spent. The AI FEP writing team were primarily NOAA members, although there were other agencies represented as well. For a BS FEP, it would likely be desirable to have a higher representation from other agencies that work in the BS ecosystem area. With respect to AFSC personnel, many of the researchers that were involved in the Bering Sea project have now moved on to other projects, such as Arctic or Gulf of Alaska research. Asking the agency to have them work on this project would necessitate prioritizing it above other work that may be contributing to other Council projects.

Finally, another aspect to consider if the Council goes forward with a BS FEP would be how to develop the outreach component. The Council's outreach program was in its infancy at the time of the AI FEP development, although attempts were made to have outreach meetings in Aleutian communities. The outreach component was more developed when the Council worked on the Arctic FMP, and the Council may wish to consider how stakeholders, both fishery and non-fishery, might interface with the development of an FEP.

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[7] Mike Sigler, personal communication, 1/23/2014.