

FISHERIES
Leadership & Sustainability
FORUM

**Innovations in U.S. Fisheries Management:
A Compilation of Selected Innovative Approaches**

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Introduction

The Fisheries Leadership & Sustainability Forum is pleased to share its second compilation of innovative practices in fisheries management. This report was developed in response to requests from past forum participants and is intended to encourage discussion and the sharing of ideas between U.S. regional fishery management councils.

To facilitate the exchange of information between regions, Fisheries Forum also hosts semi-annual forums to provide council members with an opportunity to network, share ideas, and learn from the experiences of fishery managers in other regions. In preparation for these forums, Fisheries Forum staff prepares regional reports, consistent with the theme of the forum, to explore regional management approaches in greater depth. The first report, developed for the September 2009 Forum, revolved around the different strategies councils employ to address bycatch challenges in their regions. The second regional report prepared for the May 2010 Forum focused on councils' approaches to risk policy and managing for uncertainty. The most recent report, developed for the September 2010 Forum, focused on diverse approaches to fisheries allocation decisions. These reports and other resources are available on our website at: www.fisheriesforum.org.

This second Innovations Report highlights selected innovative fisheries management approaches including: an improved stock assessment program administered by the South Atlantic Fishery Management Council; a way to shift the burden of proof used by the North Pacific Fishery Management Council; and the adoption of overfishing limits for data-poor stocks and of an adaptive management approach by the Pacific Fishery Management Council. The profiles are based on suggestions made by council members with the assistance of council staff, and include brief descriptions of each innovative management practice along with resources for additional information. The practices contained in this report provide a sampling, instead of an exhaustive list, of innovative management strategies being employed by fishery managers in the U.S. and abroad.

We welcome feedback on the examples that follow and suggestions for future topics. Please contact:

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More information about the Fisheries Forum can be found at our website: www.FisheriesForum.org.

The views presented in this document represent the best effort by Fisheries Forum staff to compile and summarize innovations and approaches as described by council members and staff. The information presented here is not comprehensive and is for the sole purpose of highlighting different approaches to fishery management issues that may be useful examples for other regions.

Improved Stock Assessment Program - South Atlantic Fishery Management Council

The South Atlantic Fishery Management Council (SAFMC) closed the red porgy fishery for several months between 1999 and 2000 due to danger of recruitment failure and estimates of excessive mortality. However, the closure proved controversial, and concerns arose about the stock assessment. At the time, the data that were used for the assessment caused confusion and uncertainty among SAFMC members and fishermen alike. Mixed species landings and the use of different common names in different areas called into question the interpretation and consistency of information used for stock assessments. This skepticism served as a catalyst to update and reform the entire stock assessment process.

To improve the quality and reliability of future stock assessments, NOAA Fisheries' Southeast Fisheries Science Center (SEFSC) and the SAFMC developed a unique stock assessment program called the Southeast Data, Assessment, and Review (SEDAR). SEDAR was developed because the previous assessment process expected too much of individual analysts, allowed too much separation between data collectors and assessment analysts, seldom included a thorough evaluation of input data series, and provided no independent peer review (J. Carmichael, pers. comm., March 2009). At its core, SEDAR is simply a cooperative program that allows for the development and review of stock assessments, but the innovation comes from involving numerous people, including fishermen, throughout the entire process.

The SEDAR program initially addressed the assessment needs of the SAFMC. However, recognizing its utility, SEFSC expanded SEDAR in 2003 to include fisheries resources managed by all three councils in the Southeast Region (South Atlantic, Gulf of Mexico, and Caribbean). Today, a Steering Committee – composed of NOAA Fisheries representatives, regional council representatives, and Interstate Commission representatives – oversees SEDAR while the SAFMC administers and houses the program.

In the past, a single person prepared the stock assessments, starting by requesting data from various resources. The models were then typically run by a single assessment analyst who was required to make numerous decisions with no formal process to obtain guidance or assistance from scientists or fishermen with potentially greater experience with the particular stock or with fisheries addressed in the assessment. Also, if the assessment was peer-reviewed, the review typically involved people tied to the assessment effort and invested in the management outcomes. SEDAR is different because it increases transparency and provides an opportunity for participation and peer review within a multi-step process.

The program centers around three workshops involving a variety of stakeholders. All workshops are open to the public and conducted according to council procedures. First, the *Data Workshop* provides a venue for documenting, compiling, analyzing and reviewing available data sets for use in the assessment. The most important aspect of this step is that those who collect data are the people who participate in data-related decisions.

Next, participants use information compiled at the Data Workshop to develop assessment models and estimate population parameters at the *Assessment Workshop*. Assessment Workshops are now conducted through a series of webinars. A draft assessment workshop report is made available to the public for comments prior to its completion and distribution. Once the assessment team considers the public comments and any necessary changes are made, an independent Peer Review Panel reviews the draft assessment report. The inclusion of the webinars and pre-reviews were implemented in 2010, and they are the most significant changes to the SEDAR process since it began. The pre-review step in this process is novel in that no other program solicits public comment on such technical work. The SAFMC noted that the complex information could be misunderstood and that the pre-review adds another step in an already time-intensive process. They expect to learn from the first iteration of this process with the new measures in place.

Participants at both workshops come from state and federal agencies, non-profit organizations, council technical and advisory panels, and the fishing industry. Participants are expected to contribute through preparation of working papers, participation in discussions, analysis of data, and completion of a workshop report. SEDAR gives fishermen a seat at the table by involving them at the workshop level, an approach that has not been adopted by other assessment programs. The three participating councils appoint representatives from each of these arenas to create a blend of different perspectives.

Finally, the *Review Workshop* brings independent experts together to peer review the data and products from the previous two workshops. The Review Workshop panels include reviewers appointed by the councils as well as the Center for Independent Experts. The review panel usually includes members from the councils' Scientific and Statistical Committees (SSCs), and appointed representatives from participating councils may act as observers.

SEDAR workshops are currently scheduled through 2013. Past workshops focused on species such as black sea bass, yellowtail snapper, spiny lobster, large coastal sharks, queen conch, and king mackerel. Four SEDAR benchmark assessments and three updates are underway for 2010. Benchmark assessments are full, new, and often first time assessments where the councils can consider or reconsider all decisions and methods. This type of assessment is in contrast to an update where additional data points are added to the time series of data that was used in the prior benchmark. The 2010 benchmark assessments include South Atlantic and Gulf Goliath grouper; South Atlantic red snapper; sandbar, dusky, and blacknose sharks; and Gulf of Mexico yellowedge grouper and tilefish. Updates are underway for prior benchmarks of Southeastern U.S. spiny lobster, South Atlantic black sea bass, and Gulf of Mexico greater amberjack.

A schedule of SEDAR workshops is available through the SEDAR homepage on the SEFSC website. Councils having jurisdiction over the stocks assessed appoint participants to SEDAR workshops. Contact the appropriate council if you are interested in getting involved with SEDAR.

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Shifting the Burden of Proof for Climate Change in the Arctic Fishery Management Plan - North Pacific Fishery Management Council

In 2006, the North Pacific Fishery Management Council (NPFMC) recognized the potential impact of climate change on fisheries within its jurisdiction. Warming trends in ocean temperatures and reduced sea ice cover in the Arctic may allow commercial fisheries to develop in waters that are currently covered year-round by sea ice. Applying its long-standing policy of integrating ecosystem considerations into fishery management decisions, the NPFMC developed discussion papers to evaluate the situation. After several years of reviewing the science, listening to public comment, and evaluating the potential impact of developing fisheries, the NPFMC approved the Arctic Fishery Management Plan (FMP) in February 2009.

At present, there are no commercial fisheries in U.S. Arctic waters off the north shore of Alaska. When the NPFMC approved the Arctic FMP, they made a landmark decision to protect the Arctic ecosystem. The NPFMC chose to take precautionary action amidst concerns that global climate change may lead to increases in ocean temperatures and changes in seasonal ice conditions, favoring the development of commercial fisheries in Arctic waters. To protect Arctic resources in the future, the NPFMC voted unanimously to adopt an FMP for the Arctic Management Area. The area consists of “all marine waters in the U.S. Exclusive Economic Zone of the Chukchi and Beaufort Seas from 3 nautical miles offshore the coast of Alaska or its baseline to 200 nautical miles offshore, north of Bering Strait (from Cape Prince of Wales to Cape Dezhneva) and westward to the 1990 United States/Russia maritime boundary line and eastward to the United States/Canada maritime boundary (NPFMC 2009).”

The NPFMC, which has jurisdiction over fisheries within the 900,000 square mile exclusive economic zone (EEZ) off of Alaska, manages fishery resources within the Gulf of Alaska, the Bering Sea, and the Aleutian Islands. Sea ice typically covers areas north of the Bering Strait, preventing fishing in the Arctic region; however, recent satellite data shows that the maximum extent of the 2008-2009 winter sea ice cover is among the lowest since research began three decades ago. Temperature rises around the Arctic Ocean are particularly dramatic when compared with the rest of the world. Warming leads to a longer and stronger summer melt season and hence, less sea ice. This warming trend causes a chain of events called the albedo feedback: less sea ice allows the ocean to heat up more during the summer, further increasing warming trends. With the apparent trends in climate change, it is conceivable that as oceans warm and fish stocks move northward, the Arctic EEZ could offer commercial fishing opportunities.

At its October 2006 meeting, the NPFMC discussed a strategy to prepare for possible changes in the Arctic region, and tasked staff with preparing a discussion paper, including options for management of fisheries in the federal waters of the Arctic Ocean. The NPFMC asserted that if commercial fishing is not appropriate in the Arctic EEZ at this time, a prohibition may be necessary until information is available to sustainably manage any emerging Arctic fisheries. The NPFMC developed a problem statement; articulated a series of goals and objectives; and tasked its staff with drafting discussion papers to frame the issues, develop potential management alternatives, and provide opportunities for input from the Ecosystem Committee, the Scientific and Statistical

Committee, Advisory Panels, and the public. The outcome of this process was a proposal by the NPFMC to develop an Arctic FMP.

The conservation and management objectives outlined by the NPFMC in the FMP include: (1) closing the Arctic to commercial fishing until data shows that fishing can be conducted sustainably and with due concern to other ecosystem components; (2) clarifying the management authorities in the Arctic, and provide the NPFMC with a vehicle for addressing future management issues; and (3) implementing an ecosystem-based management policy that recognizes the resources of the U.S. Arctic and the potential for fishery development that might affect those resources, particularly in the face of a changing climate.

Because no fishery current exists in the Arctic, the NPFMC took a unique approach to deriving conservation and management measures, including specification of maximum sustainable yield (MSY), optimum yield (OY), and procedures to set limits on annual catches to ensure overfishing does not occur. Staff consulted with stock assessment scientists familiar with North Pacific fisheries. Following several exploratory scientific surveys in portions of Arctic waters offshore Alaska, scientists calculated biomass estimates for the species collected in these surveys. Extrapolating the survey data to a larger geographic area, researchers concluded that there was a potentially exploitable biomass. The value of these fishery resources was then estimated based on records of commercial harvests of the same species in the adjacent Bering Sea. Despite data limitations, three species emerged as candidates for the FMP. The biomass estimates combined with projected commercial value indicated that these species could conceivably support a future fishery.

The three target species identified by the FMP include: snow crab (*Chionoecetes opilio*), Arctic cod (*Boreogadus saida*), and saffron cod (*Eleginus gracilis*). The FMP specifies an optimum yield for each of the three fisheries as an annual de minimis catch, sufficient only to account for bycatch in subsistence fisheries for other species. In addition, the NPFMC designated the remaining fish species in Arctic waters as “Ecosystem Component Species.” The recently approved National Standard 1 Guidelines provide the authority for conservation of non-target species, while not requiring specification of optimum yield or other status determination criteria.

Anticipating ecological changes in the Arctic region, the NPFMC employed an innovative and precautionary management approach to protect the ecosystem. The Arctic FMP was approved by the Secretary of Commerce on August 17, 2009 and implemented on November 3, 2009.

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Overfishing Limits for Data-Poor Stocks - Pacific Fishery Management Council

The 2006 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act requires regional fishery management councils to establish Annual Catch Limits (ACLs) by 2010 for stocks experiencing overfishing, and for all managed stocks by 2011. Revisions to the National Standard 1 Guidelines in 2009 also encourage Scientific and Statistical Committees (SSCs) in each region to establish overfishing limits (OFLs) and to provide recommended catch levels to the councils. For data poor species, these guidelines are especially difficult to address. Data poor species often lack scientific information on which to base decisions regarding the appropriate catch levels. New methodologies are needed to provide a universal and scientific approach for making decisions about data poor stocks.

In response to the new management requirement to set ACLs, the PFMC asked its Groundfish Management Team to conduct a review of the harvest levels of managed groundfish species. They found that, for many species, there was no documentation regarding how the previous harvest levels and maximum sustainable yield were set. They also found that establishing catch limits for data poor stocks was particularly problematic. To address the lack of documentation of previous harvest levels and to meet the new management requirements, the PFMC requested a formal review of analysis methodologies for determining harvest levels for data-poor stocks.

The PFMC chose to adopt new methodologies for setting ACLs and determining buffers for scientific uncertainty for data poor stocks. These methodologies, developed by Drs. E.J. Dick and Alec MacCall, are known as Depletion-Corrected Average Catch (DCAC) and Depletion-Based Stock Reduction Analysis (DB-SRA). Drs. Dick and MacCall first applied their methodologies to thirty-one previously assessed and primarily data-rich council-managed groundfish stocks. The researchers compared their results with existing harvest levels and demonstrated that these new methodologies could be used effectively to determine appropriate harvest levels. They then applied the same methodologies to the rest of the stocks managed by the PFMC.

Dick presented the findings to the SSC Groundfish Subcommittee in January 2010 and again to the full SSC in March 2010. The SSC agreed that DCAC and DB-SRA are an improvement over existing practices and that they are more likely to produce reliable yield estimates than methods previously in place since they effectively utilize long time series catch data and basic life history information. In April 2010, the PFMC chose to adopt the OFLs derived from these data-poor methodologies.

The PFMC adopted DCAC methodology, which uses a sum of catches calculated over a period of years, as a strategy for developing OFLs for six groundfish stocks with erratic and/or incomplete catch histories. These six stocks include blue rockfish, blackgill rockfish, gopher rockfish, honeycomb rockfish, Mexican rockfish, and squarespot rockfish. For the first three stocks, blue, blackgill, and gopher rockfish, assessments only covered a portion of the coast. The PFMC requested yield estimates for the unassessed areas, but chose the DCAC methodology for its computational simplicity given the time constraints. For the honeycomb, Mexican, and squarespot

rockfish, catches since 1999 were not considered reliable; therefore, the DCAC methodology was used and based on time periods ending with 1999.

The DB-SRA methodology is an extension of the DCAC technique. The PFMC's SSC concluded that DB-SRA is a useful tool to develop appropriate OFL recommendations for data-poor species when a complete history of removals from a stock is available. The DB-SRA approach incorporates full stock dynamics, meaning that data regarding annual catches from the onset of the fishery are necessary. Dick and MacCall used the DB-SRA method to estimate OFLs for 42 groundfish stocks; all but two (vermillion rockfish and kelp greenling) were unassessed. These stocks include 34 rockfishes (*Sebastes* sp.), four flatfishes (Pacific sanddab, rex sole, rock sole, and sand sole), one roundfish (kelp greenling), two elasmobranchs (leopard shark and dogfish), and one complex (grenadiers), and make up approximately half of those listed on the Groundfish Fishery Management Plan. The technique was used for vermillion rockfish and kelp greenling since their previous assessments lacked the confidence that was necessary to use the estimates for management. The PFMC adopted the DB-SRA technique for rockfish and flatfish species, greatly improving the use of available scientific information to manage these groundfish stocks.

The PFMC utilized DCAC and DB-SRA methodologies to meet the new federal requirement to set ACLs for all stocks and to follow the National Standard 1 Guidelines by accounting for scientific uncertainty. Reliable estimates of allowable harvest levels will help the PFMC manage data poor stocks effectively in the future.

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Adaptive Management for the Multispecies Trawl Individual Fishing Quota Program - Pacific Fishery Management Council

The Pacific Fishery Management Council (PFMC) is nearing the implementation stage of a rationalization program for four sectors of the west coast groundfish fishery. Initiated in 2003 and scheduled for implementation January 1, 2011, Amendment 20 to the Pacific Coast Groundfish Fishery Management Plan (FMP) is designed to improve efficiency in the fishery while increasing individual flexibility and accountability for interactions with overfished species. Amendment 20 includes provisions for an innovative adaptive management program (AMP) to help mitigate unanticipated consequences in the individual fishing quota (IFQ)-managed multispecies trawl fishery. The PFMC plans to implement AMP as a trailing action in the third year of the rationalization process.

The groundfish FMP manages the harvest of more than ninety species by diverse categories of stakeholders. The fishery consists of eight sectors: recreational, tribal, limited entry fixed gear, open access fixed gear, shoreside whiting trawl, shoreside non-whiting or multispecies trawl, at-sea catcher-processors, and at-sea motherships. The Amendment 20 rationalization process involves the latter four sectors. The catcher-processor and at-sea mothership sectors will be managed as cooperatives while the shoreside whiting and multispecies trawl fisheries will be managed as a combined IFQ program. The AMP that is the focus of this report will operate exclusively within the multispecies trawl IFQ program.

During the initial allocation of IFQ quota shares to the multispecies trawl fishery, 90% of quota was allocated to eligible holders of vessel permits. The remaining 10% is reserved as a set-aside for the AMP. Adaptive management is intended as a non-market mechanism to mitigate the various effects of rationalization, such as the shift of quota toward the most efficient ports and away from rural and relatively fishery-dependent ports. Spatial shifts in fishing effort and delivery patterns are expected to occur due to variations in fleet efficiency across the coast, the location of constraining bycatch species, the degree of shoreside infrastructure in various ports, and the manner in which the quota is initially allocated, among others. It is likely that some ports will see no change or even an increase in fishing activity, while other ports will decline.

The objectives for adaptive management outlined in Amendment 20 include community stability, processor stability, conservation, unintended/unforeseen consequences of IFQ management, and facilitating new entrants. The specific details of the AMP program will be developed over the next couple of years.

During the AMP development process, the PFMC could choose to identify more specific goals for the program. For example, AMP quota could protect communities by securing landings in ports adversely affected by rationalization. It could also be used as an incentive to reward selective fishing practices or promote conversion from trawl to fixed gear. The PFMC could choose to keep the goals of AMP broad in scope, and allocate quota in a proposal-driven process where the uses of AMP are defined by the individuals or entities that apply. A different approach would be a

formulaic process by which AMP quota is awarded to achieve specific goals, according to clearly defined criteria and allocation formulas.

There continues to be discussion within the PFMC about how the AMP should be structured and administered between the PFMC, NMFS, and the three Pacific states. During the first two years of rationalization the PFMC will consider the decision-making and organizational structure of the AMP program, eligibility, method of allocation, division of quota among the states, and duration of quota distributions. As the program is intended now, these allocations would be granted on a temporary basis for one or more years, though in the future the PFMC could choose to make them more permanent.

Managers and stakeholders have identified advantages and disadvantages to delaying the implementation of adaptive management. The disadvantage of waiting until 2013 is that the set-aside will not be available to mitigate immediate consequences of rationalization. However, the outcomes of rationalization will become more evident during the next two years, allowing time for the PFMC to identify and prioritize AMP uses. In the meantime, the 10% set-aside will be distributed pro rata to shareholders.

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