

October 23, 2012

Mr. Dan Wolford, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, #101
Portland, OR 97220

RE: Agenda Item F.4.c, Management Strategy Evaluation for Pacific Sardine

Dear Chairman Wolford and Council Members:

I am writing with regard to the upcoming Management Strategy Evaluation (MSE) for Pacific sardine. The Pew Environment Group appreciates that the Council has made this a priority, and we are optimistic that the Pacific sardine fishery can serve as a model for forage fishery management worldwide. However, we are concerned that the scope of the MSE will be limited to an evaluation of just one parameter in the harvest control rule. In order to manage this fishery in a way that truly achieves Optimum Yield (OY) as defined in the Magnuson-Stevens Fishery Conservation and Management Act (MSA), we request that the Council take action to ensure that the scope of the MSE includes an evaluation of all control rule parameters with particular emphasis on the performance metric of avoiding negative impacts to the broader ecosystem. We discuss the specific parameters and metrics we would like to see evaluated in greater detail below.

Management Strategy Evaluation Background

There are four parameters in the existing harvest control rule for Pacific sardine that is used to determine the annual harvest guideline for the fishery: BIOMASS, CUTOFF, FRACTION and DISTRIBUTION. While BIOMASS is determined through the annual stock assessment and update process, the CUTOFF, FRACTION and DISTRIBUTION parameters are either fixed or fixed within a range as the result of a policy determination made by the Council with advice from the relevant advisory bodies and the Council's Science and Statistical Committee (SSC).

The SSC and others have discussed the need for an MSE for Pacific sardine for several years.¹ However, the Council hadn't made it a priority until the release of a study in 2010 that raised concerns over the FRACTION parameter in the existing harvest control rule, which is utilized as a proxy for F_{MSY} .² This parameter specifies the amount of Pacific sardine available to the fishery

¹ PFMC. June 2008. Coastal Pelagic Species Stock Assessment and Fishery Evaluation. See also: PFMC, November 2011. Agenda Item F.2.c Supplemental SSC Report.

² PFMC. Amendment 13 to the Coastal Pelagic Species FMP, Draft Environmental Assessment.

when BIOMASS exceeds CUTOFF (set at 150,000mt) and is based on average sea-surface temperature at the Scripps Pier in La Jolla, CA. The study re-evaluated the stock-recruit and temperature-recruit relationships that are used to determine FRACTION and showed that the sea-surface temperature data collected at Scripps Institute of Oceanography Pier was no longer a reliable predictor of sardine productivity.³

This study prompted discussion at the Council of whether the harvest control rule should continue to be utilized as-is, whether FRACTION should be set at some more scientifically defensible harvest rate in the meantime, or whether a new parameter or new harvest control rules needed to be evaluated for use in management. Ultimately, the Council opted to propose a management strategy workshop as an initial step in evaluating the current control rule parameters. Yet while the genesis of the MSE may have come from concern over the FRACTION parameter, it is clear that the entire management framework for Pacific sardine in particular and all coastal pelagic species (CPS) in general, is in need of fundamental re-evaluation.

Management Strategy Evaluation Objective

The Council's June briefing book provides an outline of the MSE and the methodology to be used. According to this document:

*"The primary aim of the management strategy evaluation would be to provide the Council with the trade-offs achieved by alternative OFL/ABC/HG control rules. These trade-offs need to consider performance in terms of fishery yield, resource conservation, and impact on the broader ecosystem (through trophic interactions)."*⁴

Simply put, the stated aim of the MSE cannot be achieved if its scope is limited to an evaluation only of the FRACTION parameter in the current harvest control rule. In addition to FRACTION, the MSE should evaluate the CUTOFF and DISTRIBUTION parameters. Essentially, this should consist of a complete reworking of the analysis done during Amendment 8 to the CPS FMP (then called the Northern Anchovy FMP), which established the current suite of control rules and respective parameters. A truly robust MSE should also establish a process and framework for incorporating ecosystem considerations into the current stock assessment methodology for Pacific sardine.

³ McClatchie, S., Goericke, R., Auad, G., and Hill, K. 2010. Re-assessment of the Stock-Recruit and Temperature-Recruit Relationships for Pacific Sardine (*Sardinops sagax*). 2010. Canadian Journal of Fisheries and Aquatic Sciences 67:1782-1790.

⁴ PFMC. June 2012. Harvest Parameters for Pacific Sardine. Management Strategy Evaluation Planning Workshop. See Agenda Item G.7.a, Attachment 3, Proposed Workshops and SSC Subcommittee Meetings for 2012.

Management Strategy Evaluation Process

According to the MSE Planning Workshop document in the Council's June briefing book, the methodology for the MSE is broken down into four distinct steps.⁵ First, the Council must identify the management objectives it seeks to achieve and the metrics by which the alternative control rules will be evaluated. Many of these metrics are common across fisheries, such as stability in catch, probability of overfishing, impacts to habitat, bycatch, etc. However, for important forage species like Pacific sardine, the most critical metric by which to evaluate alternative control rules should address the impacts of the fishery on other managed fisheries and ecosystem components.

The second step in the MSE process is to identify the models that will be used to represent the system, including a selection of hypotheses for the operating model and a set of parameters that corresponds to the data inputs. In order to determine the impacts of sardine removal on the broader ecosystem, one approach would be to use a model such as Atlantis or Ecosim w/Ecosim. Employing a model such as Atlantis would also allow for the inclusion of spatial structure in a way that more accurately reflects the migratory dynamics of the species. While this would make parameterizing the operating model a somewhat daunting task, we feel that such an approach is necessary in order to properly account for the ecosystem aspects of the MSE. Furthermore, because ecosystem models do not adequately account for the cyclical nature of forage stocks such as Pacific sardine, the models chosen should include environmentally driven parameters to simulate regime-changes and shifts in productivity.

The third step in the process is to identify and select the alternative control rules to be evaluated. This may consist of assigning alternate values or proxies for the parameters in the current control rules, such as CUTOFF, DISTRIBUTION, FRACTION, BUFFER or Fmsy. This step may also include identification of alternate control rules that utilize parameters not found in the existing control rules. Regardless of the form taken or how the rules are parameterized, the important thing for this step is to ensure that selection of alternate control rules is done in a way that clarifies and makes explicit the ecological tradeoffs associated with each strategy.

Finally, the last step is to run the model simulations to project how the system would be impacted by the catch levels determined by each of the control rules analyzed. Depending on the management objectives established by the Council and the metrics by which the control rules will be weighed, a control rule or set of rules will be selected to form the basis of the Council's strategy for managing the Pacific sardine fishery. As stated above, this strategy must seek to minimize any negative impacts to the other marine wildlife and maintain the ecological role of Pacific sardine in the ecosystem.

⁵ *Ibid.*

Control Rule Parameters

While the genesis of the MSE stemmed from concerns over the FRACTION parameter in the existing control rule, a re-evaluation of the other parameters in the control rules are equally as important to Council's long term strategy for the fishery.

CUTOFF

In the harvest control rule for actively managed coastal pelagic species, the CUTOFF parameter is the biomass level below which directed harvest is not permitted. Should overfishing occur, CUTOFF is intended to set aside a buffer of spawning stock that is protected from fishing and available for use in rebuilding if the stock becomes overfished.⁶ For Pacific sardine, the CUTOFF value is fixed at 150,000mt and is subtracted off the top from the overall biomass available to the fishery. Accordingly, harvest levels determined by the rule will decline as overall biomass declines until it reaches the CUTOFF, at which point the harvest guideline would be zero.

There is a lack of transparency regarding how the CUTOFF value was derived and what its purpose is within the harvest control rule. For Pacific sardine, CUTOFF is set at three times the Minimum Stock Size Threshold (MSST) of 50,000 mt. According to the NS1 guidelines, MSST is defined as the greater of $\frac{1}{2} B_{MSY}$ or the minimum stock size at which rebuilding to the Maximum Sustainable Yield (MSY) level would be expected to occur in 10 years if the stock was fished at the Maximum Fishing Mortality Threshold (MFMT).

This approach to defining MSST and therefore CUTOFF is problematic because the National Marine Fisheries Service (NMFS) maintains that B_{MSY} is not used as an MSY reference point for Pacific sardine due to its cyclical nature of abundance.⁷ One objective of the MSE should be to eliminate this confusion regarding how CUTOFF is defined and its purpose within the context of the harvest control rule. If CUTOFF is intended to provide a "forage set aside" as has been claimed by some observers including one of the authors of the harvest control rule,⁸ we request that the Council transparently define a variable that both adequately accounts for rebuilding needs and provides sufficient forage for other marine species in the ecosystem by maintaining Pacific sardine's relative contribution to the California Current forage base. Recently published studies including the Lenfest Forage Fish Task Force report, the study released by Smith et al. in July 2011, and the study released by Cury et al. in November 2011, provide alternative approaches to establishing thresholds and other reference points for forage fisheries and

⁶ PFMC. January 2011. Amendment 13 to the Coastal Pelagic Species FMP, Draft Environmental Assessment. Page 23.

⁷ See Response to Public Comments. Federal Register, May 25, 2011. Vol. 76, No. 101. Final rule: Fisheries Off West Coast; Coastal Pelagic Species Fisheries, Annual Specifications. (RIN 0648-XA109)

⁸ PFMC. June 2008. Pacific Mackerel Management for 2008-2009. Agenda Item G1d. Public Comment.

should inform the MSE's review of the use of CUTOFF and MSST in the existing management strategy for Pacific sardine.⁹

DISTRIBUTION

The current Pacific sardine harvest control rule sets the portion of the fishery available in U.S. waters at 87%, implying that 13% is available outside of the U.S. Exclusive Economic Zone. There is broad agreement that this fixed DISTRIBUTION parameter does not accurately reflect the dynamic ecology of Pacific sardine and the way in which the stock expands and contracts north and south along the West Coast as the population fluctuates. Furthermore, it directly contradicts the assumption used in the Canadian sardine fishery of a 27.2% migration rate for Pacific sardine.¹⁰

The current lack of coordinated transboundary management for Pacific sardine jeopardizes the long term health of the stock. Regardless of how precautionary an approach is being taken in U.S. waters, our efforts to maintain an ecologically sustainable fishery will be for naught if total exploitation rates for Pacific sardine continue to rise, as is currently the trend. We request that the MSE include a revision of this variable for all the Pacific sardine control rules to accurately reflect actual distribution of the stock. We also encourage the Council, NMFS and the U.S. State Department to continue to explore avenues that will expand cooperation with Canada and Mexico on scientific research and coordinated international management of the fishery to prevent overfishing and provide sufficient forage in the ecosystem.

Conclusion

The MSA mandates that FMPs seek to achieve OY in order to provide the greatest overall benefit to the nation, particularly with respect to food production, recreational opportunities and protecting marine ecosystems.¹¹ Under the MSA, OY is defined as MSY as reduced by relevant social, economic and ecological factors.¹² The incorporation of these factors is thus a requirement of FMPs.¹³ Additionally, both the CPS FMP and the National Standard 1 Guidelines recognize the need for fishery managers to provide adequate forage for dependent predators.^{14, 15} The NS1 guidelines go even further by directing that in FMPs, "consideration

⁹ Smith ADM et al 2011. Impacts of Fishing Low-Trophic Level Species on Marine Ecosystems. *Science* **333** (6046): 1147-50, 26 August 2011 (published online July 21, 2011); Cury, P.M. et al. 2011. "Global Seabird Response to Forage Fish Depletion – One Third for the Birds." *Science* 334:1703-06; Pikitch, E., et al. 2012. Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs. Lenfest Ocean Program. Washington, DC.

¹⁰ DFO. 2011. Evaluation of Pacific sardine (*Sardinops sagax*) stock assessment and harvest guidelines in British Columbia. DFO Can. Sci. Advis. Sec. Science Advisory Report. 2011/016.

¹¹ 16 U.S.C. 1851 § 301(a)(1)

¹² 16 U.S.C. 1802 § 3(33)(B).

¹³ 50 C.F.R. § 600.310(e)(3)(iv)(C).

¹⁴ PFMC. 1998. Coastal Pelagic Species FMP. Page1-4.

¹⁵ 50 C.F.R. § 600.310(e)(3)(iii)(C).

should be given to managing forage stocks for higher biomass than B_{MSY} to enhance and protect the marine ecosystem.”¹⁶

As the Council determines the intent and scope for this MSE, it is important to keep these objectives and guidelines in mind. The tradeoffs (fishery yield, resource conservation and impact on the broader ecosystem) achieved by alternative control rules will reflect differing approaches to the determination of OY. Ultimately, the set of control rules chosen by the Council will be a *de facto* statement on how it intends to manage coastal pelagic fisheries, and how it evaluates the social, economic and ecological factors that go into setting catch levels. As stated above, a critical performance metric to evaluate alternative control rules should address the impacts of the Pacific sardine fishery on the broader ecosystem, including the Council’s other managed fisheries. In many ways this MSE is a test case for the implementation of ecosystem-based fishery management; it is essential that we get it right.

We appreciate the Council undertaking this endeavor and look forward to working with all stakeholders to maintain healthy oceans and sustainable fisheries.

Thank you in advance for your time and consideration.

Sincerely,

A handwritten signature in black ink, appearing to read "Steve Marx", written in a cursive style.

Steve Marx
Pacific Fish Conservation Program
Pew Environment Group

¹⁶ 50 C.F.R. § 600.310(e)(3)(iv)(C).