



September 5, 2017

Mr. Phil Anderson, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, #101
Portland, OR 97220

RE: Agenda Item I.2: Review Scoping and Select a Final Initiative for Further Development

Dear Chair Anderson and Council Members:

Ocean Conservancy, The Nature Conservancy (TNC), the Pew Charitable Trusts, Natural Resources Defense Council, Wild Oceans, Audubon California, and Oceana thank the Pacific Fishery Management Council (Council) for its continued work implementing ecosystem-based fisheries management (EBFM) and the Council's Fishery Ecosystem Plan (FEP). A changing ocean environment has and will lead to unpredictable impacts on our valuable fisheries and the ecosystem upon which they depend. Consequences for coastal communities have already been felt as a result of natural variability in the California Current, and increasing variability due to climate change will likely exacerbate existing pressures and add to uncertainty. **For these reasons, we recommend that the Council select the *Cross-FMP Effects of Climate Shifts* initiative for further development and action.** It is important that we understand potential impacts on the ecosystem, and explore tools and best practices that better prepare the Council to manage an increasingly variable and uncertain future.

Based on existing science, policy, and best practices, we recommend the following areas (discussed in more depth below) for further exploration and development as part of a potential *Climate Shifts* initiative:

1. **Conduct Management Strategy Evaluations (MSEs) for key climate-vulnerable species to identify robust harvest control rules (HCRs) and/or management actions**
2. **Implement procedural and operational best practices**
3. **Develop climate-ready indicators**

4. Explore options to directly prepare fishing communities

Additionally, we endorse and support Council engagement in the TNC workshop that will be structured to support the initiative chosen by the Council.

Background

Recent oceanographic events and their consequences on fishing-dependent communities have highlighted both the variability inherent in the California Current Large Marine Ecosystem (CCLME) and the impacts that a changing ocean can have on people.^{1,2} The “warm blob” (North Pacific marine heat wave), El Niño conditions, and raised domoic acid levels impacted West Coast fisheries and coastal communities in recent years.³ We witnessed unusual mortality events for sea lions,⁴ bird die-offs,⁵ and general low ecosystem productivity.⁶ The FEP catalogs some of the existing threats related to climate on target species and communities, and the wide-spread implications of climate change on fish and fisheries in the California Current are widely documented by multiple scientific and policy sources.^{7,8,9}

Environmental variability and climate change affect multiple parts of the ecosystem, all of which are interrelated. Many of the direct impacts of climate change, such as sea-level rise or an increasing number of storms, are driven by global forces. Approaching the question of “how to prepare west coast fisheries for climate change” requires starting from the standpoint of what is possible. While most tools to combat global climate change are beyond the control of fishery managers, the Council can deploy other management tools and scientific information to increase readiness and improve outcomes in the face of change. Achieving optimum yield while ensuring a productive and healthy ecosystem, stable fleets and thriving communities, despite climate change, is only possible with careful planning, and a *Climate Shifts* initiative can help us reach that goal.

Now is the time to focus an FEP initiative that starts preparing for climate change. With a better understanding of current variability and better ability to adapt to changing conditions in the future, we promote a more stable fleet and meet ecosystem protection goals. As the last two years have shown, conditions will change, often in surprising ways, and likely pose challenges for managers. Preparing now will help the Council meet those challenges, elevate awareness among stakeholders, and limit adverse consequences on people and the environment.

¹ NMFS Climate Science Strategy Western Region Action Plan, Appendix B. *The 2012-2015 “climate change stress test” for the West Coast*. Pg. 63.

² Daniel Mintz, The Humboldt Independent. *Crab Disaster Could Reflect Long-Term Trend*. August 16, 2016.

³ NOAA Fisheries. News and Features. *Commerce Secretary Pritzker declares fisheries disasters for nine West Coast species*. January 19, 2017. <http://www.noaa.gov/news/commerce-secretary-pritzker-declares-fisheries-disasters-for-nine-west-coast-species>.

⁴ 2013–2016 California Sea Lion Unusual Mortality Event in California (NOAA, 2016); <http://www.nmfs.noaa.gov/pr/health/mmume/californiasealions2013.htm>

⁵ Opar, A. Lost at sea: starving birds in a warming world. Audubon Magazine (2015); <https://www.audubon.org/magazine/march-april-2015/lost-seastarving-birds-warming-world>

⁶ Whitney, F. A. Anomalous winter winds decrease 2014 transition zone productivity in the NE Pacific. *Geophys. Res. Lett.* 42, 428–431 (2015).

⁷ NMFS Climate Science Strategy Western Region Action Plan. Expected Impacts of Climate Change in the CCLME. Pg. 17.

⁸ Sydeman, W.J., and S.A. Thompson. Potential impacts of climate change on California’s fish and fisheries. Farallon Institute. 2013.

⁹ California Ocean Science Trust. *Readying California Fisheries for Climate Change*. June 2017.

Recommendations

Based on knowledge gained in the previous FEP initiative around ecosystem indicators, national and regional policies, and global best practices, we suggest several actions that the Council can explore through the proposed Climate Shifts initiative. We also recommend structural, operational and procedural improvements that will help the Council prepare for coming decades, and endorse the climate workshop proposed by TNC.

1. Conduct Management Strategy Evaluations (MSEs) for key climate-vulnerable species to identify robust harvest control rules (HCRs) and/or management actions

The National Marine Fisheries Service (NMFS) recently finished a climate vulnerability assessment (CVA) to identify economically important West Coast stocks that are most vulnerable to climate change (see agenda item I.1). Based on a methodology developed and first used in New England and supported for use by the NOAA Fisheries Climate Science Strategy Western Regional Action Plan (WRAP),^{10, 11} the results can inform managers on what species should receive attention first. We support the Ad-hoc Ecosystem Workgroups (EWG) concept that the Council use the results of this investigation and conduct MSEs to identify fishery management approaches that are robust to the long-term effects of climate change.¹² These management approaches can be implemented via updated HCRs and FMP amendments, as appropriate. MSE is the evaluation of different management options using simulation. It is largely considered a powerful method to examine trade-offs, and predict which management option/s perform best when evaluated against the goals and objectives for a given fishery or ecosystem.¹³ MSEs vary widely in scope, focus, and cost; some require extensive large-scale modeling such as Atlantis, others require simpler simulations using smaller and simpler models. We recommend (1) that the Council develop a process for prioritizing and executing MSEs, similar to the stock assessment prioritization process, and (2) that based on results of the CVA, the Council select priority stocks with which to begin.

2. Implement procedural and operational best practices

a. Implement Existing Best Practices for Climate-Ready Stock Assessments

The FEP chapter on bringing Cross-FMP and Ecosystem Science into the Council Process states that “...stock assessment and other harvest-level support science are the largest category of science products directly used in the Council process.” Recognizing the importance and centrality of stock assessment to the management process, we recommend three steps to strengthen the use of climate-related information within stock assessments.

1. Task the scientific and statistical committee (SSC) with developing guidelines for how climate-related ecosystem information can be included in stock assessments.¹⁴

¹⁰ National Marine Fisheries Service, Office of Science and Technology. Assessing the Vulnerability of Fish and Invertebrate Species in a Changing Climate. <https://www.st.nmfs.noaa.gov/ecosystems/climate/activities/assessing-vulnerability-of-fish-stocks>.

¹¹ NMFS Climate Science Strategy Western Region Action Plan, pg. 41.

¹² PFMC, Ad-hoc Ecosystem Workgroup Report, March 2017, Agenda item F.3.a

¹³ Punt, André E., et al. *Management strategy evaluation: best practices*. Fish and Fisheries 17.2 (2016): 303-334.

¹⁴ PFMC, Supplemental SSC Report Agenda item H.1.c, September 2010. The SSC recommended that the SSC ecosystem subcommittee develop guidelines for how ecosystem considerations can be included in stock assessments.

2. Develop terms of reference for Stock Assessment and Review (STAR) panels and other analogous technical teams that include a review of climate and other ecosystem considerations as recommended by the EBFM Road Map.
3. Request that NMFS include ecologists and/or climate scientists on NMFS Stock Assessment Teams (STATs), STAR panels, and Council management teams (i.e., GMT, STT, HMSMT, CPSMT, and HC) where possible.

b. *Implement FMP-specific ecosystem reporting to help focus scientific efforts and investments on practical management solutions.*

We recommend developing and incorporating FMP-specific ecosystem reporting. These reports could cover indicators and ecosystem trends including information about the effects of climate change, but that directly relate to each FMP and be delivered to each advisory body, management team, and the Council at the appropriate time in each FMP's management cycle. As an example, a groundfish ecosystem report could be developed by the CCIEA program and reflect indicators and trends that most impact and are impacted by groundfish stocks and the fishery in the previous two years. The CCIEA program would then deliver and present the contents of the report to the Groundfish Advisory Panel, Groundfish Management Team, and Council at the meeting when it would be most relevant in the groundfish management cycle. Such reports would not be intended as replacements for the Annual Ecosystem Report, which provides a broad cross-FMP and cross sector overview, but will pull mainly from the same indicator database and would allow for a tailored and direct information flow.

c. *Make the EWG a permanent standing management team*

We recommend evolving the EWG from an ad-hoc committee to a permanent and standing management team. To best achieve the benefits associated with EBFM and employ the FEP, a management team dedicated to advising the Council is essential. As with other management teams, a standing Ecosystem Management Team (EMT) would include representation from the states, tribes, NOAA fisheries West Coast Region, and the NOAA Fisheries Science Centers. We recommend a distribution of membership similar to other management teams with one representative from each state, one tribal representative, and two members from NOAA Fisheries West Coast Region. The EWG already meets this, however to improve the ability of the group to advise the Council we recommend adding two members from the West Coast Fishery Science Centers, including an ecosystem expert, as well as a seat for the United States Fish and Wildlife Service. We additionally recommend adding two rotating seats to be filled by appropriate issue experts throughout the duration of a given FEP initiative.

3. Use Climate-Ready Indicators with reference points

a. *Single-species indicators*

We already use indicators and thresholds in single-species management. For example, spawning biomass is often used as an indicator of stock size and tied to the Council objective of healthy target stocks. Utilizing biomass indicator data, reference points were determined based on knowledge of a given species' life history, and then used to guide management action. Using a similar process, where known relationships exist between changes in climate and a species life history, we can use indicators and develop reference points to guide management action in response to climate change. For example, current work by NMFS around Oregon Coho salmon return indicators affected by climate variability (snowpack, river temperature, and river flow) identified a threshold where returns were significantly

lower. By tracking this indicator set and associated threshold in the annual ecosystem report, and notifying the Council when the threshold is reached, managers are better prepared to address this potential threat within the management process. We recommend that NMFS identifies those species that have known relationships between life history and climate change and where we may be able to implement thresholds on the related climate indicator.

b. Ecosystem-level indicators

Beyond single-species applications, better incorporating indicators into management at the ecosystem level is also important. Thresholds or reference points are a way to do this where scientifically possible. Oceanographically, for example, NMFS is developing a warm blob indicator that includes a threshold for when a blob will likely occur. Including this indicator in the Annual Ecosystem Report along with a notification for the Council (and/or other managers), would be valuable information for many pieces of routine management that the Council completes. We recommend that that Council investigate the warm blob indicator and other ecosystem-level indicators of climate change that may be ready for Council use now or in the near future.

The FEP five-year review, currently on the Council agenda for March 2018, could be another opportunity to consider ecosystem-level reference points as a mechanism to bring a growing body of ecosystem science and ecosystem information into the management process. We recommend that during a potential five-year review the Council refine ecosystem-level goals and objectives, including social and economic, to prioritize and guide development of indicators and subsequent reference points in the future.

4. Understand potential impacts to fishing communities

The EWG suggests that this initiative might “identify fishing communities that may be vulnerable to the physical effects of climate variability and change and also depend on income from those fish stocks that are vulnerable to climate variability and change.”¹⁵ Along these lines we offer the below options for consideration. We also note and support the EWG outlined workshop that would “focus more on the potential combined physical and socio-economic effects of climate variability and change on fishing communities.”

a. Explore the impacts of species-specific vulnerability on communities

We recommend that the Council consider further using the results of the CVA to explore the impacts of species-specific vulnerability on communities. For example, if canary rockfish and Pacific Ocean Perch are considered highly vulnerable, what will the specific effects of climate be on those species and how will those predicted changes translate for fishermen, sportfishing businesses, and ports? Methodologies developed by the Integrated Ecosystem Assessment team -some of which were presented at the SSC Ecosystem Subcommittee meeting this week -may help predict impacts on these communities and understand key vulnerabilities.

b. Address geographically shifting stocks

¹⁵ PFMC, September 2017. Agenda Item I.2.a Ad Hoc Ecosystem Workgroup Report 1

We also note that in the EWG report the concept of geographic range shifts is highlighted. We are in support of developing an emerging fisheries policy to address movement of key stocks across jurisdictional boundaries. We recommend exploring near-term policy solutions, and developing a Council policy that outlines how the Council can best address geographic shifts. For example, this policy could inform new entrants on how to build climate-ready fishing portfolios or further streamline the Exempted Fishing Permit process. Part of this could include expansion of Council Operating Procedure #24 (regarding the development of new fisheries on forage species) to all species.

TNC Climate Workshop

TNC secured funding for a workshop that will be structured to meet the needs of the Council in moving forward with the third ecosystem initiative. A two-day workshop will be held with the goal of providing a venue to address components of the climate shift initiative or evaluate climate impacts on coastal communities as part of the socio-economic initiative (if chosen).

We strongly encourage Council member and stakeholder participation in this workshop. Stakeholder input is critical to successful implementation of EBFM, as societal needs and values are a foundational part of defining what management should achieve.^{16, 17}

Conclusion

We recommend that the Council select the *Cross-FMP Effects of Climate Shifts* initiative for further development and action. In addition to the existing language that recommends an in-depth review to more fully and completely describe the effects of environmental variability and climate change on Council-managed species, we suggest that the Council consider the above actions that could be taken today to address the effects of a changing climate on the entire marine ecosystem. Finally, we encourage Council member and stakeholder participation in the TNC sponsored workshop, as discussed above.

Sincerely,



Corey Ridings
Ocean Conservancy



Gway Kirchner
The Nature Conservancy



Theresa Labriola
Wild Oceans



Seth Atkinson
Natural Resources Defense Council

¹⁶ Levin PS, Fogarty MJ, Murawski SA, Fluharty D (2009) Integrated ecosystem assessments: Developing the scientific basis for ecosystem-based management of the ocean. PLoS Biol 7(1).

¹⁷ Lenfest Fishery Ecosystem Task Force. *Building Effective Fishery Ecosystem Plans*. November 2016.



Ben Enticknap
Oceana



Anna Weinstein
Audubon California



Steve Marx
Pew Charitable Trusts