



May 30, 2016

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CC: Pacific Fishery Management Council

Re: Draft NOAA Fisheries Climate Science Strategy Western Regional Action Plan

Dear Dr. Stein and Dr. Werner:

Ocean Conservancy, Wild Oceans, the Pew Charitable Trusts, Audubon California, and Natural Resources Defense Council commend the National Marine Fisheries Service (NMFS) for its work on the draft NOAA Fisheries Climate Science Strategy (NCSS) Western Regional Action Plan (WRAP). The draft WRAP is an important and necessary step by NMFS to directly address the effects of climate variability and change on the environment and fishery resources. Given the recent unprecedented environmental change witnessed in the California Current,¹ the Plan is critical to ensure the sustainable management of our fisheries and other public trust resources. We appreciate the draft WRAP's specific vision for how NMFS will move forward in the next five years, and provide the following comments and suggestions in five areas:

¹ Pacific Fishery Management Council, March 2015, Agenda item E.1.b Supplemental IEA PowerPoint 2 re 2015 State of the California Current Ecosystem Report, http://www.pcouncil.org/wp-content/uploads/2015/03/E1b_Sup_IEA_PPT2_ElectricOnly_Garfield_Harvey_MAR2015BB.pdf (accessed May 26, 2016); and Pacific Fishery Management Council, March 2016, Agenda item D.1.a Supplemental PPT re 2016 State of the California Current Ecosystem Report http://www.pcouncil.org/wp-content/uploads/2016/03/D1a_Sup_Pwrpnt_CCIEA_Harvey_Garfield_Mar2016BB.pdf (accessed May 26, 2016).

1. Improve the WRAP structure and climate science process
2. Include social and economic data and analysis
3. Continue development and use of valuable analytical tools
4. Ensure management relevance
5. Increase public participation and scientific collaboration

As recognized by NMFS in the draft WRAP, the California Current is experiencing major environmental and climatological change. Impacts on coastal communities are already extensive, including alterations to federal and state fisheries that are of economic and social importance², sea-level rise,³ and harmful algal blooms.⁴ Key federal regional fishery management plans such as coastal pelagic species⁵ and salmon⁶ currently have large catch restrictions in place as a result of population decline associated with environmental change, with serious repercussions for the people who depend on them. Predator species are also experiencing concerning mortality events, with California sea lion pup starvations⁷ and several seabird mass deaths: Cassin's auklets in 2014,⁸ and Common Murre in 2015.⁹ Climate variability and change also create additional uncertainty for policy-makers responsible for the management of trust resources and the ecosystems that underpin their productivity. Given NMFS' legal responsibility for the sustainable management and protection of these species and the ecosystems required to support them,¹⁰ it is necessary and timely for the agency to conduct the science and analysis that addresses current variability and change, prepares for future change, and does so in a way that best responds to management needs.

1. Improve the WRAP structure and climate science process

² *Id.*, and, California Legislature Joint Committee on Fisheries and Aquaculture, *2016 43rd Annual Zeke Grader Fisheries Forum* <http://fisheries.legislature.ca.gov/content/2016-43rd-annual-zeke-grader-fisheries-forum> (accessed May 26, 2016).

³ California Coastal Commission Meeting, October 2015, *Agenda item F8a re Coastal Development Permit 4-15-0390 (Broad Beach GHAD)* <http://documents.coastal.ca.gov/reports/2015/10/f8a-10-2015.pdf> and Los Angeles Times, *Malibu's vanishing Broad Beach a sign of rising sea levels, experts say*, <http://www.latimes.com/local/la-me-beach31-2008dec31-story.html> (accessed May 26, 2016)

⁴ California Legislature Joint Committee on Fisheries and Aquaculture, *Crab Season and Domoic Acid: Lessons Learned*. <http://fisheries.legislature.ca.gov/node/27> (accessed May 26, 2016)

⁵ Pacific Fishery Management Council, "Council votes to close 2015-2016 Pacific Sardine Fishery," <http://www.pcouncil.org/2015/04/36387/council-votes-to-close-2015-2016-pacific-sardine-fishery/> (accessed May 26, 2016)

⁶ Pacific Fishery Management Council, "Council Announces 2016 Salmon Seasons," <http://www.pcouncil.org/2016/04/41860/council-announces-2016-salmon-seasons/> (accessed May 26, 2016)

⁷ NOAA Fisheries Protected Resources, *2013-2016 California Sea Lion Unusual Mortality Event in California*. <http://www.nmfs.noaa.gov/pr/health/mmume/californiasealions2013.htm> (accessed May 26, 2016)

⁸ National Geographic, January 24, 2015, *Mass Death of Seabirds in Western U.S. Is 'Unprecedented'* <http://news.nationalgeographic.com/news/2015/01/150123-seabirds-mass-die-off- auklet-california-animals-environment/> (accessed May 26, 2016)

⁹ University of Washington, Coastal Observation and Seabird Survey Team, *2015 in review: Murres on the Beach*. <http://blogs.uw.edu/coast/2016/01/07/2015-in-review-murres-on-the-beach/> (accessed May 26, 2016)

¹⁰ See, e.g., 16 U.S.C. § 1802(5), 16 U.S.C. § 1802(33), and 16 U.S.C. § 1851(a)(1).

We greatly appreciate the overall clarity and specificity of the draft WRAP. The level of guidance is appropriate and needed for regional scientists and managers, and correctly provides a foundation for agency action in the next five years. The draft WRAP also does a sufficient job of providing background information; we are pleased that NMFS sees a better understanding of climate variability and change as necessary and critical to their mission, and recognizes the significant impacts environmental change has on public trust resources.

WRAP action items

We appreciate the various action items laid out in the draft WRAP; however their organization is confusing. Actions that the agency could take to address climate variability and change are found throughout the document, but their relationship to each other, prioritization, and the agency's intent to address them is not obvious. For example, action items are found in the Opportunities section (pg. 17), as bulleted items in the Action Plan section (pg. 23), under the Action Plan "approaches" section (pgs. 24-27), and in the WRAP Action Table and Timeline (pgs. 28-34). There is redundancy among these sections, presumably designed to further describe potential action items in detail and provide the appropriate background for the reader, as well as to cross-reference them with the NCSS objectives, however, the result of this redundancy is that the actions NMFS actually intend to take are difficult to tease out. We recommend clarifying how these various action items relate to each other and presenting the information in a way that clarifies intent.

Metrics

We applaud the inclusion of metrics in the draft WRAP. Clear steps to measure performance and hold the agency accountable are critical for success and to promote transparency. Metrics *d. Number of stock assessment and Annual Catch Limits (ACLs) that are climate-informed*, and *h. Adoption of indicator(s) to inform management*, are excellent. Climate-informed stock assessments and harvest control rules are not only the crux of preparing our fisheries for environmental change, but are current areas of exploration by managers at the Pacific Fishery Management Council (PFMC).¹¹ Focusing scientific efforts to achieve this is necessary and appropriate, and responds to management needs. Similarly, using indicators to inform management is a well-recognized approach to bringing ecosystem information into the management process.¹² Although this process remains somewhat vague, we appreciate the general approach of using indicators and suggest that this metric is made more specific.

The draft WRAP states that metrics "...will be continuously evaluated..." (pg. 35) but this provides little information for managers or the public as to when, or how, the metrics will be

¹¹ Pacific Fishery Management Council *Decision Summary Document, Pacific Fishery Management Council Meeting, September 11-16, 2015* at . 1 <http://www.pcouncil.org/wp-content/uploads/2015/09/0915decisions.pdf> (accessed May 26, 2016).

¹² Livingston, P. A., Aydin, K., Boldt, J., Ianelli, J., & Jurado-Molina, J. (2005). A framework for ecosystem impacts assessment using an indicator approach. *ICES Journal of Marine Science: Journal du Conseil*, 62(3), 592-597.

applied, or if there will be public access to the results. We recommend that NMFS include more detail about when and how the metrics will be evaluated, and to make this information available to the public.

West Coast Climate Program and Committee

The draft WRAP seeks to establish a NMFS West Coast Climate Committee (WC³) and Program. The creation of a West Coast Climate Program is a step in the right direction to focus and coordinate efforts internally. The effects of climate variability and change warrant serious attention by the agency, thus the creation of a stand-alone program that can devote singular efforts to these effects, assure institutional alignment, and take advantage of the high quality science that NMFS already conducts, is proper and needed.

Regarding the WC³, the draft WRAP references an existing West Coast Climate Team as the foundation of its creation. It is not said how many people are on the Climate Team however, or what expertise and capacity they bring to the team. We recommend a more thorough and detailed description of what the WC³ would look like and what types of expertise, knowledge, and experience will be represented.

Implementation

Lastly, we recommend that the WRAP contain an implementation timeline. It is not stated when NMFS intends to finalize the WRAP, begin implementation, or review it. We recommend a periodic review to assess progress and a full review in five years at the end of the WRAP implementation timeline.

2. Include social and economic data and analysis

We appreciate NMFS' recognition of the importance of understanding the role of climate variability and change on dependent human communities. Of the seven NCCS objectives, three specifically mention dependent human communities, and the draft WRAP recognizes a lack of data that can inform human factors as a "Weakness" (pg. 16). However, despite the stated desire to address the social science aspects, the WRAP does not sufficiently address this need in its various action items or in its descriptive sections. As mentioned above, it is difficult to understand the exact prioritized action items NMFS intends to implement through the WRAP; however, when taken in totality, the amount and focus on better understanding the impacts of climate variability and change on dependent human communities appears to be insufficient.

Based on the WRAP Action Table and Timeline, of 39 total action items listed, only five are directly related to human factors. Of these five, only one will be completed without an increase in funding. Given the growing recognition of the importance of including social and economic

data and analysis in fisheries decision-making by managers and fisheries experts,^{13,14} and the agency's core mandate to achieve optimum yield, social sciences should be addressed.

A better understanding of the social and economic underpinnings of existing and proposed policies can help NMFS achieve optimum yield and implement its EBFM policy.¹⁵ Optimum yield requires the consideration of ecological, social and economic factors,¹⁶ thus highlighting social and economic data collection and analysis will improve the information managers have available about the existing relationships between environmental change and human communities, and foster informed consideration and transparent decision-making. Today, many of these decisions are driven by anecdotal information and personal experience, as opposed to analysis or modeling provided from the social sciences. Stronger social science and greater inclusion of social and economic data and analysis will aid Councils and NMFS when considering management actions, and better support the legally mandated achievement of optimum yield.¹⁷

We recommend summarizing appendix C, "Coastal-zone change is expected to come on many fronts," and including it in the main body of the report to highlight the expected change on human communities, and incorporate social science in any final list of action items.

3. Continue development and use of valuable analytical tools

Management Strategy Evaluation

We appreciate NMFS' use of Management Strategy Evaluation (MSE) and the prominence it is given in the draft WRAP. MSE has been proven to be a valuable tool for managers to better understand the potential implications of their decisions, and allows for more transparent and informed policy-making.¹⁸ MSE is an ideal use of NMFS' growing capacity around ecosystem modeling tools, such as Atlantis, and could be applied in a variety of ways to answer management questions. The WRAP proposes using MSE to better understand and prepare for the effects of climate variability and change on Pacific hake, sablefish, and North Pacific Albacore. The selection of these three species appears to be a combination of management

¹³ Pacific Fishery Management Council, *September 2015, Scientific and Statistical Committee Supplemental Report, Agenda Item D.1.a.*, available at http://www.pcouncil.org/wp-content/uploads/2015/09/D1a_SUP_SSC_SEPT2015BB.pdf. (accessed May 26, 2016)

¹⁴ Fulton, E. A., Smith, A. D., Smith, D. C., & van Putten, I. E. (2011). Human behaviour: the key source of uncertainty in fisheries management. *Fish and Fisheries*, 12(1), 2-17.

¹⁵ National Marine Fisheries Service Policy Directive, Ecosystem-Based Fisheries Management Policy, Discussion Draft (Sept. 9, 2015).

¹⁶ 16 U.S.C. § 1802(33).

¹⁷ 16 U.S.C. § 1851(a)(1).

¹⁸ Holland, D. S. (2010), "Management Strategy Evaluation and Management Procedures: Tools for Rebuilding and Sustaining Fisheries", OECD Food, Agriculture and Fisheries Working Papers, No. 25, OECD Publishing. doi: 10.1787/5kmd77jvhvkjf-en

need and artifact of agency expertise;¹⁹ while we support using MSE to better prepare all stocks, we encourage NMFS to continue to engage with managers at the PFMC and with the public to ensure that resources are dedicated to the stocks that need their attention most, and that NMFS also use its exceptional ecosystem science expertise towards conducting MSEs that go beyond single stock applications.^{20, 21, 22}

Ecosystem indicators

We commend NMFS for highlighting the importance of ecosystem indicators in the draft WRAP. The PFMC is currently conducting several processes to highlight and improve its use of ecosystem indicators in management; one to make the existing suite of indicators presented in the annual ecosystem status report more management-relevant,²³ and a second to investigate the use of ecosystem indicators in the sablefish stock assessment.²⁴ Both highlight the interest of managers to better incorporate ecosystem information into decision-making and utilize the existing expertise and data of the California Current Integrated Ecosystem Assessment (CCIEA) program. The WRAP recognizes (pgs. 12-13) NMFS' strong capacity in existing observations and time series data collection. On-going agency commitment to high-quality data collection has created a world-class database of ecosystem knowledge. It is imperative that NMFS capitalize on this strength by bringing this information into the decision-making process. We therefore support further strengthening and use of indicators through single-species applications such as the current sablefish effort; informational applications like the annual state of the ecosystem report; development of ecosystem reference points around leading indicators; and investigation and development of forecasting abilities.

California Current Integrated Ecosystem Assessment

Beyond ecosystem indicator development and use, the CCIEA provides critically needed information and analysis for managers, and will be even more important given a changing

¹⁹ Pacific Fishery Management Council *Ecosystem Workgroup webinar*, <http://www.pcouncil.org/2016/04/41979/ad-hoc-ecosystem-workgroup-ewg-to-hold-webinar-may-19/> (accessed May 26, 2016)

²⁰ Fulton, E. A., Smith, A. D., Smith, D. C., & Johnson, P. (2014). An integrated approach is needed for ecosystem based fisheries management: insights from ecosystem-level management strategy evaluation. *PLoS one*, 9(1), e84242.

²¹ Kaplan, I. C., Horne, P. J., & Levin, P. S. (2012). Screening California Current fishery management scenarios using the Atlantis end-to-end ecosystem model. *Progress in Oceanography*, 102, 5-18.

²² Punt, A. E., A'mar, T., Bond, N. A., Butterworth, D. S., de Moor, C. L., De Oliveira, J. A., ... & Szuwalski, C. (2014). Fisheries management under climate and environmental uncertainty: control rules and performance simulation. *ICES Journal of Marine Science: Journal du Conseil*, 71(8), 2208-2220.

²³ Pacific Fishery Management Council <http://www.pcouncil.org/ecosystem-based-management/coordinated-ecosystem-indicator-review-initiative/> (accessed May 26, 2016).

²⁴ Pacific Fishery Management Council *Decision Summary Document, Pacific Fishery Management Council Meeting, September 11-16, 2015*. Pg. at 1. <http://www.pcouncil.org/wp-content/uploads/2015/09/0915decisions.pdf> (accessed May 26, 2016)

environment. Web-based tools and models, such as Atlantis, ERDAPP,²⁵ and Ecological Risk Assessment, developed by the CCIEA will be able to respond in real-time to scientists and managers, and are central to understanding and answering management questions at the ecosystem level.²⁶ The analysis and products provided by the CCIEA are critical to implementing EBFM, and will be key to successful execution of the EBFM policy.

We additionally recommend that NMFS coordinate the WRAP with their recently finalized EBFM policy and draft EBFM roadmap. Many of the same concepts, strategies, and principles overlap and inform the same management processes, thus it is vitally important to ensure that these two important and central planning documents are coordinated in their approaches and implementation strategies.

4. Ensure management relevance

Responding to management need is the single most important process element of the WRAP. While high quality science and investigative products add to the scientific body of literature and promote general understanding, without drawing clear lines to management need NMFS misses opportunities to make decisions with the best scientific information available, leave our managers without the tools and information they need, and fall short of providing highly effective management solutions. The process must not be a linear one, but an iterative conversation between NMFS scientists and external managers and the public. Science in and of itself will not prepare our fisheries and dependent communities for climate change.

We appreciate the WRAPs recognition of this. Throughout the WRAP, there is mention of integrating the activities and needs of different management bodies, and making sure climate science is responsive to this. We encourage the continued engagement of the CCIEA program with management bodies like the PFMC, and hope that the resulting WC³ and West Coast Climate Program will also meaningfully engage.

At the same time, Appendix E outlines high-level priorities for climate science that fall into four categories of information and science needs. Specifically, the priorities for *Marine Ecosystem Information on Climate Effects* pose questions that may ultimately lead to development of management programs that appropriately respond to emerging climate science. While NMFS has identified these questions and data needs to begin answering these questions, the WRAP should explain how NMFS will apply new information to answer these questions and make recommendations for management.

Finally, as part of any engagement strategy, we recommend that the WC³ and the West Coast Climate Program include in their efforts an exercise to ensure that scientific priorities are

²⁵ National Oceanic and Atmospheric Administration *IEA ERDDAP*, <https://coastwatch.pfeg.noaa.gov/erddap/index.html> (accessed May 26, 2016)

²⁶ National Oceanic and Atmospheric Administration, *California Current Integrated Ecosystem Assessment* <http://www.noaa.gov/iea/regions/california-current-region/current-work/index.html> (accessed May 26, 2016)

directly tied to management goals and objectives. The PFMC includes goals and objectives in all of their Fishery Management Plans and Fishery Ecosystem Plan, as well as outlines identified scientific needs and priorities in their Research and Data Needs document.²⁷ Other cited partner management groups such as the International Whaling Commission (IWC) and the Pacific States Marine Fisheries Commission have some, albeit limited, aspirational documentation that can also help guide the strategic direction of NMFS' climate science approach. Active consideration of these goals and objectives can help ensure that the resulting science is useful, and meets the long-term needs and intentions of these primary management bodies.

5. Increase public participation and scientific collaboration

In addition to responding to management need, NMFS should seek public input and advice where possible. There is scant mention of engaging with the public directly in the draft WRAP, and even the current process of public engagement on the draft WRAP has been insufficient. The public can help inform NMFS on areas of need and interest, and provide valuable information and insights that the agency alone does not have. While the draft WRAP covers engagement with management groups, such as the PFMC and the IWC, these groups should not be the only conduit to public participation in the climate science discussion. The WRAP cites a "...two-way dialogue and feedback loop with key management partners..." (pg. 36) but how and with what frequency is not addressed. We recommend that NMFS provide details on their vision of public engagement, and provide opportunities for the public to directly engage with NMFS. We also recommend that NMFS consider the addition of a public seat to the WC³ and that the committee meetings are open to the public. Given the importance of the material to the public, the inclusion of industry, environmental-NGO, recreational fishermen and other ocean user groups is warranted.

We also note the lack of identified collaboration with state and tribal climate science efforts.²⁸ For example, the West Coast Ocean Acidification & Hypoxia Panel,²⁹ led by the California Ocean Science Trust, is a state-led effort that directly synthesized and provided management recommendations around preparing our fisheries for climate change. Additionally, the Pacific Coast Collaborative³⁰ specifically targets preparing the North American west coast and Alaska for climate change and ocean-related issues. At a minimum, NMFS should be coordinating

²⁷ Pacific Fishery Management Council, *Research and Data Needs, 2013*. http://www.pcouncil.org/wp-content/uploads/Res_Data_Needs_2013_FINAL.pdf (accessed May 26, 2016)

²⁸ Pacific Fishery Management Council, *September 2015, Ecosystem Workgroup report, Agenda Item D.1.a*, At 10-11. http://www.pcouncil.org/wp-content/uploads/2015/08/D1a_EWG_Rpt_Initiatives_SEPT2015BB.pdf (accessed May 26, 2016)

²⁹ California Ocean Science Trust, *West Coast Ocean Acidification and Hypoxia Panel* <http://westcoastoah.org/> (accessed May 26, 2016).

³⁰ Pacific Coast Collaborative, Climate Change. <http://www.pacificcoastcollaborative.org/priorities/climateaction/Pages/ClimateAction.aspx> (accessed May 26, 2016)

efforts with state-led groups and projects like this to avoid duplication of efforts and to share lessons learned.

In closing, we highly value NMFS' efforts on the draft WRAP, and appreciate the opportunity to comment. This document is a critical step in addressing the effects of climate variability and change on our ecosystem and managed species, and the impacts on dependent human communities. We hope to see improvements to the WRAP structure and science process, inclusion of social science in the climate science process, increased use of key analytical tools like MSE and ecosystem indicators, and additional opportunities for non-NMFS scientific groups and the public to participate in NMFS' climate science process.

Sincerely,



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Anna Weinstein
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Elizabeth Murdoch
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