Coastal and Ocean Climate Applications (COCA) Program:
Understanding Climate Impacts on Fish Stocks and Fisheries to Inform Sustainable Management

Healthy and productive fisheries are an essential component of the U.S. economy. In 2014, U.S. marine commercial and recreational fisheries contributed $214 billion in sales impacts and provided 1.83 million jobs.[1] Sustainable fisheries create and maintain jobs, support working waterfronts, provide opportunities for commerce, and help meet the growing demand for seafood across the U.S. and the world.

There is increasing concern about the impacts of climate variability and change on fish stocks, fisheries, and marine ecosystems in the U.S.[2] Climate variability and change influence many parameters (e.g. extreme events, winds, ocean temperatures, stratification, currents, coastal precipitation, inundation, etc.) that directly and indirectly affect marine ecosystem conditions including the abundance, distribution, and productivity of fish stocks that support economically important fisheries.[3] Sustainable fisheries management in a changing climate requires an improved understanding of how climate, fishing, and other stressors interact to affect fish stocks (including their habitats and prey), fisheries and fishing-dependent communities.

To address these issues of growing concern, in 2014 the Office of Oceanic and Atmospheric Research (OAR), Climate Program Office and the National Marine Fisheries Service (NMFS) Office of Science and Technology launched a new partnership to advance understanding of climate-related impacts on fish or other species that support economically important fisheries and fishing communities. The goal is to inform sustainable fisheries management and promote resilience of the nation's fish stocks and fisheries in a changing climate.

This new partnership directly addresses priorities identified in the 2015 NOAA Fisheries Climate Science Strategy (Strategy). The Strategy identifies seven objectives that are designed to meet the climate related research and information requirements needed to fulfill NOAA Fisheries mandates. To address these objectives, the Strategy outlines several immediate and near-term actions to ensure consistent implementation of the Strategy across the NMFS regions. NMFS is working in collaboration with its partners and stakeholders to develop Regional Action Plans (RAPs) that identify region specific research and information needs. Projects funded under this funding opportunity will support the

[1] https:// http://www.st.nmfs.noaa.gov/economics/publications/feus/fisheries_economics_2014/index
[2] NOAA Fisheries Climate Science Strategy 2015 http://www.st.nmfs.noaa.gov/ecosystems/climate/national-climate-strategy
[3] http://www.nefsc.noaa.gov/press_release/2013/SciSpot/SS1307/

near-term actions of the Strategy and the research priorities identified in relevant Regional Action Plans. The Strategy and draft RAPs are available here: https://www.st.nmfs.noaa.gov/ecosystems/climate/national-climate-strategy.

For FY17, this OAR/NMFS partnership, through the Coastal and Ocean Climate Applications (COCA) Program, will continue to take a regional approach to improving the resilience and adaptation of fisheries in a changing climate by soliciting proposals under two competitions. The first competition solicits proposals for projects in the California Current Large Marine Ecosystem (CCLME) and the second competition solicits proposals for projects in the Northeast U.S. Continental Shelf Large Marine Ecosystem (NESLME).

Figure1. The ten Large Marine Ecosystems of the United States. Source: NOAA Technical Memorandum NMFS-NE-183.

Competition I – Understanding Climate Impacts on Fish Stocks and Fisheries in the California Current Large Marine Ecosystem

The California Current Large Marine Ecosystem (CCLME) is located in the Northeastern Pacific and stretches from the U.S.-Canada border to Baja California, Mexico (see figure 1).[4] In 2013, U.S. marine commercial and recreational fisheries in Washington, Oregon, and California contributed $32.1 billion in sales impacts to the US economy.[5] That year, California generated the most fisheries-related sales of any state.[6]

For this competition, COCA, in partnership with NMFS, is soliciting proposals for multidisciplinary efforts to better understand projected impacts of climate variability and

[4] For more information about the CCLME, visit:https://swfsc.noaa.gov/textblock.aspx?id=1051&ParentMenuId=111
[5]https://www.st.nmfs.noaa.gov/economics/publications/feus/FEUS-2013/feus-2013-infographics-combined-totals
[6]https://www.st.nmfs.noaa.gov/economics/publications/feus/FEUS-2013/feus-2013-infographics-comm-totals

change on CCLME fish stocks and fisheries. Projects should build on existing information to identify climate, ocean and fish stock scenarios in the CCLME, evaluate the performance of alternative fisheries management strategies under future scenarios, and investigate the socio-economic impacts of climate variability and change on fisheries and fishery dependent communities. The projects should be specifically designed to provide information to fishery managers that enhances the application of climate-related data and information in fishery stock assessment and management decisions in the region. Proposals should focus on U.S. managed fisheries in the CCLME.

The project team can request up to $700,000 a year for three years, for a total of $2.1 million over three years.

The project should:

1. Collaborate with relevant research and decision-making institutions (e.g. NOAA Laboratories, Fisheries Science Centers, and Cooperative Institutes; other federal agencies; non-governmental organizations; academic institutions; state, tribal, and local governments; private sector organizations) - to the extent this collaboration enhances the effectiveness of the research and its outcomes.
2. Include interdisciplinary collaborations (e.g. between physical, ecological, social, economic scientists and fishery managers/decision makers) and promote partnerships between the scientific and marine resource management communities for continued use and understanding of climate-related information.
3. Leverage relevant past or current research, modeling, observations and monitoring, and outreach efforts.
4. Provide a clear plan for how the project will be managed. This may include information about the coordination and management of multiple research projects; integration of research results across projects; outreach and engagement with decision-makers, stakeholders, and other scientists; coordination between institutions; and communication of deliverables and results to NOAA in a coordinated manner.
5. Enhance the use and application of climate-related data and information into fisheries stock assessments, habitat assessments, ecosystem assessments, and/or management plans, practices, and decisions.
6. Provide outreach and training on the research results to inform other scientists and decision-makers in the region.

Proposals need to address one or more of the following to support the research priorities:

- Improved understanding of the direct (e.g. recruitment, growth, physiology, behavior) and indirect (e.g. trophic interactions, habitats) impacts of climate variability and change on fish and fish stocks.

- Improved understanding of how climate variability and change, fishing pressure, and other stressors interact to affect fish stocks and ecosystem state.
- Development and application of high-resolution, coupled, regional climate-ocean-ecosystem models to provide past and future projections for improving our understanding of climate impacts on fish and fish stocks.
- Improved acquisition, integration, synthesis, analysis, delivery, and application of existing (historical and current) climate and marine ecosystem observations and monitoring information.
- Evaluation of current fishery management strategies given potential future impacts from climate variability and change.
- Socio-economic research to understand past and potential future impacts of climate variability and change on fisheries and fisheries-dependent communities to advance the identification of adaptation options.
- Development and implementation of communication efforts based on user-friendly, science-based information resources (e.g. tools, trainings, guidebooks, websites, communities of practice) to enhance communication, awareness and/or visualization of climate impacts on fish stocks and fisheries.

Competition II – Understanding Climate Impacts on Fish Stocks and Fisheries in the Northeast U.S. Continental Shelf Large Marine Ecosystem (NESLME)

The Northeast U.S. Continental Shelf Large Marine Ecosystem extends from Cape Hatteras, North Carolina to the northern extent of the Gulf of Maine (see figure 1). In 2014, U.S. marine commercial and recreational fisheries generated over $36 billion in sales impacts and supported over 360,000 jobs.

The NESLME has been experiencing climate-related changes and is projected to be significantly impacted by changing climate conditions in the future. For this competition, COCA, in partnership with NMFS, is soliciting proposals for projects focused on the NESLME that advance the understanding and projection of the impacts of climate variability and change on (1) fisheries-related species (species that support economically important fisheries) and/or (2) investigate the socioeconomic impacts of climate variability and change on fisheries and fishery dependent communities. COCA will prioritize proposals that support fisheries management and planning decisions through the identification and evaluation of robust management strategies, adaptive management processes, and climate-informed reference points (see objectives 1, 2 and 3, in the NOAA Fisheries Climate Science Strategy). Proposals that address transboundary issues between the NESLME and the Southeast Large Marine Ecosystem will be accepted.

The project team may request up to $500,000 a year for three years for a total of $1.5 million over three years.

Proposals must address one or more of the following research priorities:

- Research to improve understanding of the direct (e.g. recruitment, growth, physiology, behavior) and indirect (e.g. trophic interactions, habitats) impacts of climate variability and change on fish stocks.
- Research to improve understanding of how climate variability and climate change, fishing pressure, and other stressors interact to affect fish stocks and ecosystem state.
- Development and application of high-resolution, coupled, regional climate-ocean-ecosystem models to provide past and future projections for improving our understanding of climate impacts on fish stocks.
- Improved acquisition, integration, synthesis, analysis, delivery, and application of existing (historical and current) climate and marine ecosystem observations and monitoring information.
- Social and economic research to understand past and possible future impacts of climate variability and change on fisheries and fisheries-dependent communities to advance the identification of adaptation options.
- Development and implementation of communication efforts based on user-friendly, science-based information resources (e.g. tools, trainings, guidebooks, websites, communities of practice) to enhance communication, awareness and/or visualization of climate impacts on fish stocks and fisheries.

All projects should:

1. Collaborate with relevant research and decision-making institutions (e.g. NOAA Laboratories, Fisheries Science Centers, and Cooperative Institutes; other federal agencies; non-governmental organizations; academic institutions; state, tribal, and local governments; private sector organizations) - to the extent this collaboration enhances the effectiveness of the research and its outcomes.
2. Include interdisciplinary collaborations (e.g. between physical, ecological, social, economic scientists and managers/decision makers), and, if applicable, promote communication and partnerships between the scientific and marine resource management communities for continued use and understanding of climate-related information.
3. Leverage relevant past or current activities, programs, or projects in the region.
4. Enhance the use and application of climate-related data and information into fisheries stock assessments, habitat assessments, ecosystem assessments, and/or management plans, practices, decisions.

5. Advance the application and integration of climate–related information into NOAA's fisheries stewardship responsibilities.

While the intent is to fund projects from both competitions, the total number of projects and amount of support are subject to the availability of funding.

Data Management Guidance Requirements

Responsible NOAA Official
For questions regarding this guidance and for verifying accessibility of data produced by funding recipients: Adrienne Antoine, Adrienne.Antoine@noaa.gov

Data Accessibility
NOAA requires public access to grant-produced data. The use of open-standard formats and methods for data sharing is encouraged. Applicants must describe their approach in the Data/Information Sharing Plan section of their application (see the CPO Federal Funding Opportunity for more information on this requirement). Data will be well documented with structured metadata and will be provided in a timely manner (typically within two years of data collection). Below are examples of methods to enable public access to grant-produced data:

- Data are submitted to the NOAA National Centers for Environmental Information (NCEI), which will provide public access and permanent archiving.
- Data are to be submitted to one of the following relevant International Council for Science (ICSU) World Data System facilities: https://www.icsu-wds.org/community/membership/regular-members.
- Data are submitted to another NOAA facility (other than NCEI), which will operate a publicly accessible online data server for these data.
- An existing publicly accessible online data server at the funded institution is to be used to host these data.
- Data are to be submitted to a public data repository appropriate to this scientific domain.
- Funding recipients will establish their own data hosting capability.
- Proposal may request permission not to make data publicly accessible (the application should include a rationale for lack of public access, and if funded approval will need to be obtained from the Responsible NOAA Official listed above).

Researchers shall be required to submit accessible format (e.g., Adobe PDF with accessibility check performed) final pre-publication manuscripts to the NOAA Institutional Repository (https://repository.library.noaa.gov/) upon acceptance of their paper by a journal.

Grantees shall be required to specify funding sources using the FundRef mechanism when papers are submitted for publication. (Publishers have established FundRef to gather this information in structured way. FundRef allows multiple funding sources to be identified, and enables agencies to determine what published papers were supported in whole or in part by their funds.)

Resources
Proposals should include the costs of data sharing or archiving in their budgets.

Additional Information for the COCA Program

Specifics about the Proposal

Proposals that can show that they are building on, but do not replicate, what is already known from the published literature about the proposed topic prove that the principal investigators (PIs) have a comprehension of the topic and that their proposed work will augment existing science and/or applications capacity.

Investigator Teams

The proposal should include an explanation of the roles of all investigators and how the team will interact and integrate the multiple components. Investigators who will not be requesting funds for salaries must also be listed, along with their estimated time of commitment.

For proposals involving multiple investigators, proposals should clearly identify how the team and activities will be managed and identify team members responsible for facilitating and managing the larger group.

Partners

We encourage partnerships and collaborations between the researchers and relevant institutions e.g. NOAA Laboratories, Fisheries Science Centers, and Cooperative Institutes; non-governmental organizations; academic institutions; state, tribal, and local governments; private sector organizations; and other federal agencies (e.g. Department of the Interior, National Aeronautics and Space Administration). Letters of support, or commitment, from partners are encouraged to accompany the proposals.

Cost-sharing

Cost, leveraging, and in-kind sharing of resources is encouraged and should be reported within the proposal.

Interaction with NOAA

Applicants whose proposals are chosen for funding will be expected to undertake an ongoing dialogue with the NOAA Climate Program Office, NMFS Office of Science and Technology, and relevant NOAA partners. Projects will be expected to submit annual reports and respond to periodic data and information requests.

References

Websites:

- Coastal and Ocean Climate Applications Program http://cpo.noaa.gov/coca
- National Marine Fisheries Service - http://www.nmfs.noaa.gov/
- National Marine Fisheries Service – Office of Science and Technology http://www.st.nmfs.noaa.gov/index
- National Marine Fisheries Service - Climate, Fisheries and Protected Resources http://www.nmfs.noaa.gov/stories/2014/03/climate_portal.html
- National Marine Fisheries Service – Southwest Fisheries Science Center https://swfsc.noaa.gov/
- National Marine Fisheries Service – Northwest Fisheries Science Center https://www.nwfsc.noaa.gov/
- National Marine Fisheries Service - Northeast Fisheries Science Center http://www.nefsc.noaa.gov/
- National Marine Fisheries Service Economics Program: https://www.st.nmfs.noaa.gov/st5/publication/index.html
- NOAA Next Generation Strategic Plan - http://www.ppi.noaa.gov/ngsp/

Reports and Papers:

- Link, J.R.; Griffis, R; Busch, S. (editors). 2015. NOAA Fisheries Climate Science Strategy. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/SPC-155,70p. http://www.st.nmfs.noaa.gov/ecosystems/climate/national-climate-strategy
- Griffis, R and Howard, J (editors.) 2013. Oceans and Marine Resources in a Changing Climate: A Technical Input to the 2013 National Climate Assessment. Island Press.
- Sherman, K; Celon, P; and Adams, S 2004. NOAA Fisheries Service's Large Marine Ecosystems Program: Status Report. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NE-183, 21p.