

ECOSYSTEM WORKGROUP SUPPLEMENTAL REPORT ON THE CALIFORNIA  
CURRENT ECOSYSTEM STATUS REPORT AND SCIENCE REVIEW TOPICS

Dr. Toby Garfield of the Southwest Fisheries Science Center (SWFSC) and Dr. Chris Harvey of the Northwest Fisheries Science Center (NWFSC) presented the California Current Ecosystem (CCE) Status Report (ESR) in a public webinar on March 2, 2022. The Ecosystem Workgroup (EWG) discussed the presentation and associated report during its March 8-9, 2022, meeting. We thank Drs. Garfield and Harvey, the California Current Integrated Ecosystem Assessment (CCIEA) team, and the other contributors for their efforts to provide another comprehensive and informative report.

Our general sense from the ESR is that relative to the past six years, ocean conditions cooled to levels rarely seen since 2013. Prominent physical marine ecosystem features in 2021 included La Niña conditions, strong upwelling, and a large, offshore marine heatwave (largely west of the Exclusive Economic Zone). From a biological perspective, primary production increased, as did the abundance of lipid-rich euphausiids such as *Euphausia pacifica* relative to recent years throughout much of the northern CCE (although overall krill biomass was below average in the central and southern CCE) while northern anchovy (*Engraulis mordax*) abundance was near an all-time high south of Cape Mendocino. This robust forage base likely accounted for high reproductive success in several seabirds at Southeastern Farallon Island and sea lions (*Zalophus californiana*) on San Miguel Island. From a human perspective, fishery landings in 2021 were similar to those in 2020 as decreased landings of highly migratory species, crab, and coastal pelagic fishes were balanced by increased catches of market squid, salmon, and shrimp. This change in landing composition translated to a 13 percent increase in fishing revenue in 2021 relative to 2020. Terrestrial conditions included record-high air temperatures, severe drought, wildfires, reduced snowpack, and lower, warmer streamflows, which may have implications for salmon population dynamics.

The EWG would like to emphasize the importance of the ESR and the continued collection, analyses, and syntheses of long-term data streams to monitor changing conditions. The ESR and related products featured prominently in the revised Fishery Ecosystem Plan (FEP), and we hope these documents will continue to complement each other moving forward. The EWG would also like to express its appreciation for the development of indicators of long-term climate change (ESR Appendix E). The explanation of the limits and challenges in providing forecasts at different timescales is informative and useful. We feel that the [Early Warning Indicator of Ecosystem State](#) will be a valuable tool moving forward, that the inclusion of snowpack information will be of great value in forecasting salmon stocks, that the sea level rise and coastal flooding risk indicators are important tools when considering port-side vulnerability and risk, and that the climate change appendix does a good job integrating FEP and CCIEA goals. The EWG also appreciates the expansion of the Habitat Compression Index, which provides valuable insight to downstream processes including species redistribution, shifts in predator-prey interactions, and potential overlap between fishing and protected species.

We offer the following points for consideration for future ESRs:

- The EWG appreciates the inclusion of Appendix D, a two-page executive summary of the highlights of the ESR, and suggests it be moved to the front of future reports.
- Include a figure for seabird data from Yaquina Head, Oregon in addition to seabird data from Southeast Farallon Islands, California, in the main ESR text instead of only in an appendix.
- Including some transboundary data, especially from Baja California. Although this is obviously outside of the jurisdiction of the Pacific Fishery Management Council, transboundary biological and physical conditions can affect important components of the CCE (e.g., Pacific bluefin tuna) in the United States.
- Improving integration of indicators within the Human Dimensions section and between that section and others in the report, in consultation with the EWG, the Ecosystem Advisory Subpanel (EAS), and the Scientific and Statistical Committee (SSC). For example, is it possible to develop a narrative around how declining diversification intersects with trends in revenue consolidation and community social vulnerability? Are any of those trends influenced by biophysical changes in the ecosystem, such as habitat compression?
- Each year additional indicators are included at the Council's request, and we would like to help identify opportunities to shorten the report and reduce or focus the workload on the CCIEA team.

During a joint discussion between the EWG and EAS on March 8th, we noted the growing scope and increasing workload of the ESR, and the potential to develop report automation to reduce workloads. We also noted that much of the value of the annual report is the interpretation and discussion we get from the experts and overwhelming the report with indicators might dilute this discussion. One area for possible greater efficiency could include transitioning the ESR to an automated reproducible format. Dr. Harvey informed us, however, that the ESR's 20-page limit makes such a transition challenging due to the fine-scale document formatting that is necessary to achieve the limit. The EWG suggests that we instead implement an equivalent Word and figure limit to promote such a transition. The EWG would be happy to work with the CCIEA team to review current and past reports to develop general guidelines for Word and figure limits that would keep the main document at its current readable length while still allowing the ESR team to automate some sections of the report.

In addition to workload easing that might be achieved through automating indicators or report sections, the ESR could benefit from a Council-wide discussion of which parts of the report are not essential and can be removed or refined. Several of the FEP initiatives suggested in the draft updated FEP Appendix (EWG Report 1, Agenda Item H.2.a) include some review of ESR indicators. Any initiative that includes review of any part of the ESR should consider not just adding to the ESR but should also explicitly aim to make ESR production more efficient, whether through automating, removing, or replacing sections.

The EWG also reviewed the [Supplemental IEA Team Report 2](#), which provides review topics for the SSC-Ecosystem Subcommittee: broad strategic review of the salmon indicator portfolio, reference periods for plotting and estimating recent means and trends in fishery landings and revenue data, and development of the climate change appendix. We are looking forward to comments from other advisory bodies, particularly the EAS, on the climate change appendix and

whether that portion of the ESR could be automated. If the SSC and the CCIEA team take on revisions to the climate change appendix, we recommend including nowcasts and forecasts of near- and long-term changes in species distribution and contextualizing the appendix relative to the most recent Intergovernmental Panel on Climate Change reports. The CCIEA team chose thoughtful and timely topics for review by the SSC, and we support their choices. Another topic to consider for future review by the SSC-Ecosystem Subcommittee is development of sections within the ESR that provide integrative perspective on the ecosystem role of highly migratory species and groundfish, as well as the impacts of ecosystem conditions on those FMPs.

PFMC  
03/10/22