Alaska Fisheries Science Center Ecosystem Status Reports for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska

External Independent Peer Review

By

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Executive Summary

The Alaska Fisheries Science Center (AFSC) produces three Ecosystem Status Reports (ESRs) annually to provide ecosystem information for the North Pacific Fishery Management Council (NPFM Council). These reports are tailored toward supporting the Council's annual process to set groundfish harvest specifications. The reports specifically inform the setting of Acceptable Biological Catch (ABC) and Over Fishing Levels (OFL) through two primary pathways: by informing stock assessments' risk tables (risk tables) and by providing context for discussion by Council committees that make the final ABC and OFL determinations. The effectiveness of the ESRs relies on timely production to maximize uptake into fisheries management decisions. Specifically, ESRs are produced at the same time as the stock assessments in order to use the most current data to inform the annual harvest specifications. The ESRs also serve as an on-ramp for ecosystem and climate research to get into the Council review process.

The ESRs provide an important source of contextual ecosystem information for stocks for which there are limited available data. The ESRs are also used or referenced outside of the groundfish harvest specification process. For example, ESR presentations are given to the Council's eastern Bering Sea crab specification process. Other examples include informing research gaps/priorities, identification of new indicators, and informing policy needs of the NOAA Fisheries Alaska Regional Office.

During February and March 2023, a review of the Alaska Fisheries Science Center Ecosystem Status Reports for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska was organized by the NMFS. The objectives in seeking the review were two-fold: a review of the goals of the ESR and feedback on how best to meet these goals. Specifically, reviewers were asked:

Objective 1: Are the ESRs' goals to inform the development of ABC and OFL still appropriate or should the goals be broadened?

Objective 2: And how can we better achieve these ESRs goals?

In summary, my findings about the specific ToRs for the review are:

- ToR 1: ESRs have proven to be very useful in the fisheries management context. The stock assessment risk tables are successfully used and are an important achievement. These efforts should continue and remain a priority of the annual ESR process.

However, the overall contribution of the ESR is well below its potential, and the scope and activities could be enlarged. The collection of data and contributions by individual contributors could be streamlined through the establishment of a protocol, automated workflows and routines. The current process is time-consuming, and leaves little time for the editors to establish a feedback process with the contributors. It also leaves the ESR editors with the sole responsibility to integrate and prioritize the information received. This task should be performed by a group of representatives from different contributions to the ESR and the fisheries management process.

- ToR 2: The ESR team could intensify its activity around the Council with several initiatives, most notably, providing a summary of the implications of considering ecosystem elements in decision-making (for example, with a summary of the risk tables and a trend analysis of uptake by single stock assessments). It could also aim at informing and educating the Council members about the importance of considering ecosystem elements in fisheries management (under normal conditions) and how extreme events or changes can affect ecosystem structure and functioning (mechanistic understanding of possible changes). The development of tailored analyses on specific questions that the Council may have can also be a good opportunity to further engage with the Council, knowing that NOAA AFSC has the tools in-house to perform such analysis.

  However, the tight annual schedule of the fishing management process constrains the amount of information that the ESRs can produce to inform the Council. To maximize the exchange of information, one could separate key products that need to be updated every year (to provide tactical advice, targeting stock-specific issues) from those that require a longer update period, such as every 2-4 years, which are most useful for providing strategic advice (targeting broader ecosystem health issues).

- ToR3: A classification between contributions to the ESR by authors that are necessary to achieve the main goals (priority 1) from those that are complementary (priority 2) could allow alleviating the ESR editors' workload. Priority 1 contributions could originate from reliable sources that provide information with a quick turnover. According to the large expertise that NOAA AFSC researchers have in several key topics of the ESR, these contributions could originate primarily from NOAA AFSC researchers and close collaborators.

  Emerging synthesis efforts may be interesting for some part of the scientific community contributing to the ESRs, and they could also be interested in the ESR documents and data being associated with a DOI that can be cited. It may be worth mapping the interests of

community and non-scientist contributors to the ESR. Social gatherings to foster the communication of local communities participating in the ESR could be an activity to explore, in addition to the creation of an online platform to give visibility to the ESR contributors. Contributors to the ESR could be awarded, every year, with tokens of appreciation (a formal certificate of contribution and a gift). Letters to institutions whose members are involved in the ESR could be issued yearly.

- ToR4: The ecosystem assessment of part 1 of the ESRs is currently descriptive. Efforts to bring in quantitative synthesis products could allow summarizing part 2 contributions, complement the report cards and bring value to the ESR, while generating interest for contributors to be involved in the synthesis phase. A list of potential quantitative synthesis products to include were identified during the review process.

  The analyses included in the ESR mostly rely on *in situ* observations from the most recent past. Additional analyses could be added if the developers of the ESRs take full advantage of the broad information that Earth Observation products (including satellite products) and ecological models bring to the table. In this context, additional sources of information available at NOAA AFSC could inform the ESRs bringing new insights into the document: (i) information about the food web interactions and dynamics, (ii) tradeoff analyses and scenario development and testing, considering environment, ecology and economy, could be incorporated; (iii) ecosystem health indicators could have a specific section within the ESR synthesis part. Adding a couple of figures from the synthesis analyses in the “In Briefs” documents could make them more informative.

- ToR5: To increase the dissemination of the ESR, data access and availability, issuing a DOI to each report or dataset generated could improve citations. The generation of stand-alone infographics that illustrate the annual status of the ecosystems could be useful, and these could be made publicly available. Dynamic visualizations of the ocean using novel gaming technologies as a non-traditional way to disseminate scientific results and engage with different audiences could be explored (e.g., the NOAA VES-V Viewer). The creation of alliances with institutions outside the research context, such as art foundations or schools, could allow widening the audiences that could be informed about the ESR reports and science, while benefitting from a larger distribution.

- ToR 6: Building on the success of the ESRs to influence the results of the recommendations from individual stock assessment authors via the use of the risk tables, efforts to influence the process “up” and “down” the pipeline may provide additional success. The coordination of key

information for stock assessment authors at the beginning of the process to directly influence the calculation of the Maximum Acceptable Biological Catch could be explored. A joint workshop with the stock assessment authors and the ESR team could be an initial step to identify opportunities.

The ESR team could also aim at presenting the summary risk table and trend analysis at the Groundfish Plan Teams (GPT) and Scientific and Statistical Committee (SSC) meetings, with the aim to highlight the importance of considering ecosystem issues and evaluate previous attempts and results of doing so. Additional synthesis products could be of interest to these meetings to bring a strategic perspective into the discussion, too.

- ToR 7: As a summary of previous ToR reflections, twenty-six recommendations are provided and are ranked by cost, priority and targeted audience. Ten recommendations are highlighted as the first actions to undertake because they are identified as low costs and high priority. They are related to the content or the workflow of the ESR process and the involvement of individual contributors to the ESR. Six recommendations are identified as high priority and medium costs, and include actions to complement the content of the ESR with additional quantitative information and further invest resources to inform the fisheries management process. These could be tackle if moderate additional resources are available. Additional recommendations can contribute to broaden the capability of the ESR to achieve general objectives and engage with a larger audience, but they can only be achieved if substantial personnel and financial resources are allocated.

Overall, during the review it became evident that the leading group of the ESRs is very capable and is doing a very fine job, but is faced with a major task every year. The core group involved in the ESRs development currently involves three researchers, with an effort level that corresponds to less than 3 person-years annually. I consider this personnel allocation insufficient for the successful development of the ESRs and the future improvement of the process. The mechanisms how other researchers and initiatives at the AFSC and other NOAA centres contribute to the ESRs were not evident. The EBFM toolbox in Alaska developed within NOAA AFSC could potentially bring several collaborations into the ESRs, such as interlinking the Ecosystem & Socioeconomic Profiles (ESPs), the Climate-informed Ecosystem Models and MSEs, the Protected Species Catch Limits, Fishery Closures, Optimum Yield Caps, and Gear Modifications initiatives and the information generated by the Alaska Food Web Research initiative, among others.

The annually Alaska Fisheries Science Center Ecosystem Status Reports for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska are a significant step towards an Ecosystem-Based Fisheries Management, and additional personnel and resources should be dedicated to further foster the ESRs.

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Background

The National Marine Fisheries Service (NMFS) is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage USA marine living resources based upon the best scientific information available (BSIA). NMFS science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external scientific peer reviews are essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These experts must conduct their peer reviews impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards[1].

Scope

The Alaska Fisheries Science Center (AFSC) produces three Ecosystem Status Reports (ESRs) annually to provide ecosystem information for the North Pacific Fishery Management Council (NPFM Council). These reports are tailored toward supporting the Council's annual process to set groundfish harvest specifications. The reports specifically inform the setting of Acceptable Biological Catch (ABC) and Over Fishing Levels (OFL) through two primary pathways: by informing stock assessments' risk tables (risk tables) and by providing context for discussion by Council committees that make the final ABC and OFL determinations. Both pathways can be used to support decisions to keep or reduce the recommended maximum ABC from each stock assessment model. ESRs are disseminated along with the stock assessments, and ESR

[1] https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/memoranda/2005/m05-03.pdf

presentations are given to numerous council committees annually during the fall groundfish quota-setting process.

The effectiveness of the ESRs relies on timely production to maximize uptake into fisheries management decisions. Specifically, ESRs are produced at the same time as the stock assessments in order to use the most current data to inform the annual harvest specifications. The ESRs also serve as an on-ramp for ecosystem and climate research to get into the Council review process. While Alaska is known for having data-rich stocks, there are also many data-poor stocks, which are also managed by the Council. The ESRs provide an important source of contextual ecosystem information for stocks for which there are limited available data. The ESRs are also used or referenced outside of the groundfish harvest specification process. For example, ESR presentations are given to the Council's eastern Bering Sea crab specification process. Other examples include informing research gaps/priorities, identification of new indicators, and informing policy needs of the NOAA Fisheries Alaska Regional Office.

The objectives in seeking this review are two-fold: a review of the goals of the ESR sand feedback on how best to meet these goals. The objectives are:

Objective 1: Are the ESRs' goals to inform the development of ABC and OFL still appropriate or should the goals be broadened?

The advantages of staying focused on ABCs and OFLs include having a narrowly-defined, targeted on-ramp for ecosystem science into the Council process that helps define the timing, interpretation, and communication of the reports.

Challenges of the narrow focus include a limitation of the application of ESRs to other Council decisions, and limited application to other interested parties outside of the Council process (e.g., industry, local communities, Tribes).

Objective 2: How can we better achieve these ESRs goals? This objective can be divided into multiple subcomponents:

1. A review of the content of the reports, specifically how the ecosystem science is selected, incorporated and synthesized.
    a. How data and indicators are selected, developed, and displayed.
    b. The structure of the reports.
    c. The balance of information across the reports and web content.
2. A review of the process of how the reports are disseminated in the council process.

a. Timing and number of presentations, balancing crowded agendas with ESR presentations.

b. Integrating ESRs in the stock assessment development and harvest specification process (communication with individual stock assessment author, Groundfish Plan Team, and Council).

c. The use of stock-specific risk tables to directly connect ESRs to the maximum ABC recommendation.

3. A review of the ESRs role in an evolving ecosystem information space as new data needs, capabilities, and products are developed.

    a. Balance of ESRs with stock-specific Ecosystem and Socio-Economic Profiles (ESPs) and longer-term Fishery Ecosystem Plans in communicating ecosystem information to the Council.

    b. Integration of climate information, model-based products, forms of risk assessments, social and economic information, etc.

4. A review of ESR staff organization

    a. Costs and benefits of ESR staff in multiple or one program.

Review Activities

The review activities followed five steps:

1. *Pre-review Background Documents*

Reviewers were asked to look at the following background materials and reports prior to the review:

Ecosystem Status Reports: https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands#2018 and In Brief pamphlets for 2021 and 2022.

2021 reports for the Gulf of Alaska and the Aleutian Islands to compare the impacts of alternating trawl survey years on data availability in these two large marine ecosystems. These are:

2022 Ecosystem Status Report - Eastern Bering Sea

ESR EBS In Brief

2022 Ecosystem Status Report - Gulf of Alaska

ESR GOA In Brief

2022 Ecosystem Status Report - Aleutian Islands (survey year)

ESR AI In Brief

2021 Ecosystem Status Report - Gulf of Alaska (survey year)

ESR GOA In Brief

2021 Ecosystem Status Report - Aleutian Islands

ESR AI In Brief

Alaska's Ecosystem Status Reports: A Collaborative Approach to Inform Fisheries Management, posted under the 2021 reports: https://players.brightcove.net/659677166001/4b3c8a9e-7bf7-43dd-b693-2614cc1ed6b7_default/index.html?videoId=6287018070001

Regarding stock assessment risk tables: Dorn, M., and Zador, S.G., 2020. A risk table to account for concerns external to stock assessments when developing fisheries harvest recommendations. Ecosystem Health and Sustainability. 6 (1):1-11

Examples of risk tables can be found in stock assessments available here: https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessments-and-fishery-evaluation. We ask that they review some risk tables in stock assessments (primarily the ecosystem considerations sections, which are informed by ESRs) for stocks found in each Large Marine Ecosystem, for example:

Data-rich stocks:

Gulf of Alaska Walleye Pollock

Eastern Bering Sea Pacific Cod

Data-poor stocks:

Gulf of Alaska Demersal Shelf Rockfish

Aleutian Islands Northern Rockfish

Eastern Bering Sea Kamchatka Flounder

2. *Attend and participate at the review meeting*

The meeting consisted of presentations by NOAA and other scientists, stock assessment authors and others to facilitate the review, to answer any questions from the reviewers, and to provide any additional information required by the reviewers.

3. After the review meeting, reviewers shall conduct an *independent peer review report* in accordance with the requirements specified in this PWS, OMB guidelines, and TORs, in adherence with the required formatting and content guidelines; reviewers are not required to reach a consensus.
4. Each reviewer should assist the Chair of the meeting with contributions to *the summary report*.
5. *Deliver their report*s to the Government according to the specified milestones dates.

ESR Review Process

The Alaska Fisheries Science Center Ecosystem Status Reports for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska review was organized by the NMFS, and was chaired by Dr. Stephani Zador, Deputy Director Resource Ecology and Fisheries Management Division, NOAA Fisheries, Alaska Fisheries Science Center, and assisted by Dr. Bridget Ferriss, Research Fisheries Biologist, Resource Ecology and Fisheries Management Division, NOAA Fisheries, Alaska Fisheries Science Center, Dr. Elizabeth Siddon, Fisheries Research Biologist, NOAA Fisheries, Alaska Fisheries Science Center, and Dr. Ivonne Ortiz, Senior Research Scientist, University of Washington.

The review team included Dr. Yan Jiao, professor at Virginia Tech, College of Natural Resources and Environment, Department of Fish and Wildlife Conservation (USA); Dr. Matthew Cieri, Maine Department of Marine Resources (USA); and myself, Dr. Marta Coll Montón, from the Institute of Marine Science (ICM-CSIC), Barcelona (Spain). Jointly, we conducted an external review of the ESR. The review took place at NOAA Fisheries, Alaska Fisheries Science Center 7600 Sand Point Way NE, Seattle, Washington (USA), during 3 days in late February to early March 2023 where scientists from AFSC, led by Dr. Stephani Zador, made numerous presentations covering the seven specific ToRs, and where there were around 20 people in attendance each day.

The review started timely at 9 AM on February 28, 2023, with around 20 people in attendance (7 people physically and the majority online). The participants included the key responsible people for the ESR of Eastern Bering Sea (Dr. Bridget Ferriss), Aleutian Islands (Dr. Ivonne Ortiz), and Gulf of Alaska (Dr. Elizabeth Siddon), and Dr Stephani Zador, Deputy Director Resource Ecology and Fisheries Management Division, and the CIE review team consisting of Dr. Yan Jiao, Dr. Matthew Cieri and Dr. Marta Coll Monton.

The first day of the review, several presentations were given (see Appendix 1) by Stephani Zador, Elizabeth Siddon (NOAA, AFSC), Ivonne Ortiz (UW), Bridget Ferriss (NOAA, AFSC), Sarah Gaichas (NOAA, NMFS), Chris Harvey (NOAA, NWFS), Franz Mueter (UAF, NPFMC SSC), Diana Evans (NPFMC), Kalei Shotwell (NOAA, AFSC), Bridget Ferriss (NOAA, AFSC). During the second day of the review, specific presentations to guide the discussion of each ToR question were given by Stephani Zador (NOAA, AFSC), Elizabeth Siddon (NOAA, AFSC), Bridget Ferriss (NOAA, AFSC) and Ivonne Ortiz (UW), (see Appendix 1). The third day of the review process was dedicated for the CIE review team to start writing their reports, while two meeting were hold at the hotel to clarify issues between the review team.

Summary of Findings

ToR 1. Should the ESR continue to tailor efforts to inform the ABC and OFLs? (Obj.1)

The ESRs are primarily used to inform ABCs and OFLs year calculations led by stock assessment authors (beginning ~2012). Information tailored to inform the ABCs and OFLs has proven to be very useful in the fisheries management context, and the meetings with the stock assessment authors have proven to be effective as a first entry to the management process. The application of risk tables by stock assessment authors are efficient, and are an important achievement. This efforts should continue and remain a priority of the ESR yearly process.

However, this overall contribution may be hidden by the whole process. To overcome this limitation, as a **recommendation #1**, the uptake of ESR into the stock assessment process could be further visualized if a synthesis risk table about the information provided and assimilated by all stock assessment authors is generated and incorporated into the ESR reports, yearly, and is provided to the SSC and the Council. The ESR report could include this information as a summary section providing the risk table summary and a trend analysis of uptake with time (**recommendation #2**). This summary could become a synthesis product aiming to highlight the importance of the ESR reports to inform primary fisheries management issues in the region.

In addition, reviewing all the information provided, it became evident to me that the ESRs have the potential to inform additional steps in the process of taking up ecosystem information into the fisheries management with a strategic perspective (**recommendation #3**). This could be done including in the ESRs and derived products synthetic information about:

A. Spatial-temporal changes of key ecosystem components, drivers (environment and human activities), impacts and effects using a short and long term perspective to ease the interpretation of stocks and ecosystem dynamics. This information could include:

i) Abundance, biomass, distribution and trophic ecology of key species and trophic guilds, targeting those species or guilds that can be most informative about changes in the region and that hold enough information to become indicators of change on a regularly basis;

ii) Fishing activity in the region, including a summary of landings, revenues, discards, and bycatch by fleet, key species and trophic guilds, and effort distribution by fleet. This summary could aim at highlighting any important changes related to previous observed years or provide a long-term perspective;

iii) Dynamics of key environmental changes in the region, including the evolution in space and time of key factors affecting the commercial species, key prey and predators, and productivity processes in the ecosystem (e.g., temperature, salinity, productivity and productivity fronts, sea ice).

B. Socioeconomic dynamics in the region (short and long term perspective), including information about key factors:
   i) Business viability (e.g., return on equity, assets an profit margins);
   ii) Social livelihood (e.g., number of fishers, wages and gender disparity);
   iii) Resilience (e.g., education, fishers age structure and age of vessels);
   iv) Social justice (regional fishers sectoral representative bodies, non-USA fishers or fishermen representing ethnic minorities in sectoral executive committees, etc.).

C. Mechanistic understanding about the main environmental and fishing effects on the ecosystem structure and functioning, and how changes in the environment towards differential ecosystem phases or regimes can affect specific ecosystem compartments, including commercial stocks, their prey and predators.

Most, if not all, this information is already available through other NOAA initiatives, e.g., EBFM toolbox in Alaska including the Ecosystem & Socioeconomic Profiles (ESPs), the Climate-informed Ecosystem Models and MSEs, the Protected Species Catch Limits, Fishery Closures and Gear Modifications studies, Optimum Yield Caps analyses, and the information generated by the Alaska Food Web Research initiative[2] within the AFSC. Once the relevant information from these initiatives for the ESRs is identified and organized, the yearly incoming of data to include

[2] https://www.fisheries.noaa.gov/alaska/science-data/alaska-food-web-research

these topics in the reports should be straightforward. If properly tailored to the management needs, this information could be used to inform other steps in the current fisheries management process, such as the allocation of TACs, or specific considerations that may be risen in specific years.

Reviewing all the information provided, it also became evident to me that the collection of data and contributions to the ESR report by individual contributors is a process that could be streamlined through the establishment of a protocol and automated routine workflow. This automated routine workflow could include, for example, an automated system to upload contributions by individual authors following a pre-established template, and the possibility to submit the indicators data to allow additional integrated analyses (**recommendation #4**).

The process of collecting individual contributions by participant authors of the ESR is time consuming, and leave little time for the editors to establish a feedback process with the contributors. It also leaves the principal editor the sole responsibility for integrating and prioritizing the information received. Ideally, this task should be performed by a group of people that represent different contributions to the ESR and the fisheries management process (**recommendation #5**).

It is important to note that to accomplish the third, fourth and fifth recommendation provided here, it is evident that additional support to the ESR core team is needed in terms of personnel and funding (see answers to ToR 3). The team seems to be currently understaffed and any additional tasks need to be planned taking this consideration into account.

ToR 2. How can the function of the ESR team better meet the Council's needs? (Obj.1, Obj.2.3)

The current functions of the ESR team to meet the Council's needs include the allocation of 1-2 lead editors per ESR, the coordination of individual contributions to the report (inclusion in an ESR is considered an 'end-point' for contributors), the liaison with stock assessment authors to provide them with the specific information they need, the synthesis presentations that highlight some key contributions, and the preparation of ESR reports (that provide an assessment of broader ecosystem health).

During the review process, it became evident to me that the ESR team could intensify its activities around the Council to achieve the following:

- Provide a summary of the implications of considering ecosystem elements in decision-making (**recommendation #6**) (using, for example, the risk table summary mentioned in the first and second recommendation of ToR 1, **recommendation #1**, and the trend analysis of uptake with time, **recommendation #2**).

- Inform and educate the Council members about the importance of considering ecosystem elements in fisheries management (when normal conditions happen) and how extreme events or environmental changes can affect ecosystem relationships (mechanistic understanding of the changes) taking into account the principles of the Ecosystem Approach to Fisheries Management (EAFM) and Ecosystem-based Fisheries Management (EBFM) (Dolan et al. 2016). Outcomes from **recommendation #3** in ToR 1 could benefit this **recommendation #7**.

- Related to the point above, the use of a diversity of modelling tools (using statistical and mechanistic approaches) to model and analyze specific processes and mechanisms in the ecosystem could be used to inform the Council about key ecological topics of interest. Several capabilities within NOAA AFSC already exist and can be used in this direction.

- Continue building a trusted partnership where the Council can ask specific questions / doubts when needed. In this respect, the development of tailored analyses on specific questions that the Council may have can be a good way to proceed (**recommendation #8**).

- The tight annual schedule of the fishing management process constrains the amount of information that the ESRs can produce every year to inform the Council. To maximize the exchange of information, one solution could be to separate key products that need to be updated every year (to provide tactical advice, targeting stock-specific issues) from those that can be provided over a longer update period, such as every 2-4 years, that are most useful for strategic advice (targeting broader ecosystem health issues) (**recommendation #9**).

Regarding the specific format of the ESRs, they mainly consist on two different parts: the report cards and ecosystem assessments (part 1) and the individual contributions by participants (part 2). This makes the reports very long, but at the same time provide a good reference for all contributors to the ESR. During the review meeting, we discussed placing all individual contributions on an online appendix, but we identified that this could come with a risk of discouraging participation. Before deciding either way, a survey among the individual participants of the report should be conducted to evaluate the risk and know the best option on how to proceed (**recommendation #10**).

I found the report cards especially informative. However, the figures in the ESR are small and their size too small to properly show the actual numbers. A solution could be to add a second figure, plotting the last 5 years for each indicator (green rectangle in the original figures) to allow an in-depth analysis of the recent past (**recommendation #11**).

ToR 3. How can the ESRs better meet the needs of the contributing scientists and other knowledge holders? (Obj.1, Obj.2.3)

The participation of communities and individual contributors to the ESR is a large part of the document. ESRs are reliant on collaborators within and external to NOAA to share their data, knowledge and expertise. Contributors value their participation to the ESRs because (i) it raises profile of data sets, research programs and providers, (ii) it provides additional value out of data through connections to other information, (iii) it potentially advances their incorporation into stock assessments, ecosystem analyses, future indicators and models, and (iv) it allows justifying funding requests and program resources.

On the other side, the interaction with communities and contributors poses an important workload to the ESR editors. The ESR editors face challenges communicating back, and maintaining contributors' interpretation and attribution. Overall, due to the quick deadlines and current organization, there is limited time for the synthesis of all contributions, which can generate doubts on how contributions were used and incorporated.

As already mentioned in ToR 1 (**recommendation #4**), the collection of data and contributions to the ESR report by individual contributors should be streamlined through the establishment of a protocol and automated routine workflow. This automated routine could include an automated system to upload contributions by individual authors following a pre-established template, and provide the possibility to submit the data associated with the indicators to allow additional integrated analyses. This automation would ideally free up some time of the ESR editors. This time could be dedicated to the synthesis of the information and to integrate and prioritize the information received with a group of people that represents different contributions to the ESR process (**recommendation #5**). This could positively affect both the editors and the contributors to the ESR.

Since the content of the ESR is large, a classification between contributions that are necessary to achieve the main goals (priority 1) and contributions that are complementary (priority 2) could allow alleviating the ESR editors workload (**recommendation #12**). Ideally, those contributions within priority 1 could originate from reliable sources that provide information with a quick turnover.

According to the large expertise that NOAA AFSC researchers have in several key topics of the ESR, priority 1 contributions could originate primarily from NOAA AFSC researchers and close collaborators (**recommendation #13**). A meeting early in the process of writing the ESR with all priority 1 contributors could help streamline the workflow.

Synthesis efforts may be interesting for the scientific community contributing to the ESRs, especially if these efforts were to contribute to curriculums. Synthesis products are discussed in section ToR 4, below. Another option could be to provide a citable DOI for a report. The data of the ecosystem indicators could be integrated into a database and could also be cited with a DOI. Several options to obtain DOIs for documents and data sets currently exist (e.g., figshare[3], zenodo[4], biorxiv[5]). Data could also be hosted in regional initiatives such as the Alaska Ocean Observing System[6] (**recommendation #14**).

Community and non-scientist contributors to the ESR may find additional motivations to participate in the ESR. It may be worth mapping their interests and tailored specific actions to ensure they get specific value out of the partnership. For example, isolated local communities may value the capacity of the ESR to bring visibility to their local contexts and seek engagement with a larger community. Social gatherings to foster the communication of local communities participating in the ESR could be an activity to organize every two or three years in specific locations (**recommendation #15**). Additionally, the creation of an online platform to give visibility to the ESR contributors could also contribute to the creation of a sense of community (**recommendation #16**). There are several examples of online platforms that feature observers of the natural world that could serve as inspiration (e.g., Observers of the Sea "*Observadores del mar*"- https://www.observadoresdelmar.es/, or NOAA citizen science initiatives such as https://oceanservice.noaa.gov/citizen-science/).

Additionally, contributors to the ESR could be awarded, every year, with tokens of appreciation, such as a formal certificate of contribution and a gift (t-shirt, cap, bag). Letters to institutions whose members are involved in the ESR could be issued yearly (**recommendation #17**).

[3] https://figshare.com/
[4] https://zenodo.org/
[5] https://www.biorxiv.org/
[6] https://aoos.org/

ToR 4. How can the way the ecosystem science is selected, incorporated, and synthesized in the ESRs be improved? (Obj2.1)

The ESR report is divided into two clear sections: the report cards and ecosystem assessments (part 1) and the single contributions (part 2).

The single contributions are key to the report, as discussed in ToR 3. As described above, a division between contributions that are necessary to achieve the main goals (priority 1) and contributions that are complementary (priority 1) could allow alleviating the workload. Ideally, those contributions within priority 1 could originate from reliable sources that can provide information with a quick turnover. According to the large expertise that NOAA AFSC researchers have in several key topics of the ESR, priority 1 contributions could originate primarily from NOAA AFSC researchers and close collaborators (**recommendation #13**). A meeting early in the process of writing the ESR with all priority 1 contributors could help streamline the workflow.

The ecosystem assessment of part 1 is currently very descriptive. Some efforts to bring in quantitative synthesis products could allow summarizing part 2 contributions, could complement the report cards and could bring value to the ESR, while generating interest for contributors to be involved in the synthesis phase of the ESR. A list of potential quantitative synthesis products to include are:

1. Summary of the risk tables, as described in ToR 1 (**recommendation #1 and #2**).
2. Summary of Ecosystem and Socio-Economic Profiles (ESP) results, when several commercial stocks have ESP, within the ESRs. This information could be summarized in a table and incorporated to the ESR (**recommendation #18**).
3. Summary of spatial-temporal changes of key ecosystem components, drivers (environment and human activities), impacts and effects using a short and long term perspective to ease the interpretation of stock and ecosystem dynamics (**recommendation #3, ToR 1**), including information about (i) Abundance, biomass, distribution and trophic ecology of key species and trophic guilds, (ii) Fishing activity in the region, (iii) Dynamics of key environmental changes in the region, and (iv) socioeconomic dynamics in the region.
4. Summary of mechanistic understanding about the main environmental and fishing effects on the ecosystem structure and functioning, and how changes in the environment towards differential phases can affect specific ecosystem compartments, including commercial stocks, their prey and predators (**recommendation #3, ToR 1**).

Most of this information is already available through other NOAA initiatives (EBFM toolbox) within the AFSC. Once the relevant information from these initiatives for the ESRs is identified, the yearly incoming of data to include these topics in the reports should be straightforward.

Overall, the analyses included in the ESR mostly rely on in situ observations from the most current past. Additional more complex analyses could be added if the developers of the ESRs take full advantage of the broad information that Earth Observation products (including satellite, and models) bring to the table. In this context, during the review process, it became evident that additional sources of information available at NOA AFSC could inform the ESRs bringing new insights into the document (**recommendation #19**):

1. Information about the **food web interactions and dynamics**: diet composition of main commercial species and by trophic guilt or functional group could be incorporated. Food web analyses (qualitative or quantitative, or both) could be included to evidence the interrelationships of species in the ecosystem. In this context, some important species or groups are not included in the reports, such as sharks, large pelagic fish or benthoopelagic fish. Those can be important parts of the ecosystem and, if relevant in the region, an effort could be made to incorporate them.
2. **Tradeoffs analyses and scenario developing and testing**, considering environmental, ecological and economic issues, could be incorporated. In this context, ecological and ecosystem model to be used in a strategic way could be part of the ESRs, while they can also be used for tactical advice if properly developed (Craig and Link, 2023; Karp et al., 2023; Pennino et al., 2022). The ESR reports should take advantage of the modelling initiatives within the region[7] (Hollowed et al., 2020).
3. **Ecosystem health indicators** could have a specific section within the ESR synthesis part and they could be selected according to specific characteristics, such as easy to interpret, easy to update, complementarity, specificity and responsiveness to certain drivers. In this sense, previous initiatives such as the IndiSeas international initiative could provide a good starting point to identify indicators to target (Coll et al., 2016; Link et al., 2010; Shin et al., 2012; Shin et al., 2018). Additional initiatives such as the identification of marine Essential Biodiversity Variables (EBV) could also serve as inspiration (Miloslavich et al., 2018; Muller-Karger et al., 2018).

[7] https://www.fisheries.noaa.gov/alaska/ecosystems/alaska-climate-integrated-modeling-project

Regarding on how to improve the work and workflow, one idea that was discussed during the review session was that the ESR team could explore the opportunities that could arise while teaming up with universities and graduate programs. This could attract graduate students to develop their final projects with the ESR context and could help with specific products or tailored analyses of the report (**recommendation #20**).

The “In Briefs” documents are provided as a complementary to the ESR and are a summary of the full report, with additional information about the management uptake of the ESR information. Overall, they are very informative and easy to digest. Adding a couple of figures from the synthesis analyses recommended above could improve their information role. In the “Management Uses” section, I suggest to add the percentage of stocks that were informed by the ESR and the percentage of stocks whose ABCs and OFLs were adjusted according to the ESRs (**recommendation #21**).

ToR 5. How can the process of disseminating the information in the ESRs be improved? (Obj2.2)

Currently, the products to disseminate the information of the ESR are the annual ESR reports and risk tables, the “In Briefs” documents, presentations to the Council and to meetings, conferences, workshops, media or individual meetings, tailored videos and the website. All these products are very useful and interesting, and reach a wide audience of potential readers.

To increase the dissemination of the ESR, data access and availability, the association of a DOI to each new report or the data generated could improve citations (**recommendation #14**, ToR 3). As also discussed above, every year contributors to the ESR could receive a token of appreciation, such as an official certificate of contribution and a gift. Letters to institutions whose members are involved in the ESR could be also issued yearly (**recommendation #17, ToR 3**). The creation of an online platform to give visibility to the ESR contributors could also contribute to the creation of a sense of ESR community (**recommendation #16, ToR 3**) and to disseminate results.

Additionally, the generation of stand-alone infographics that can be downloaded from the website and that illustrate year status of the ecosystems could be useful to the scientific community, Council members, and other users (non profit organizations, education platforms, etc.) (**recommendation #22**). These could become very popular if distributed broadly.

Dynamic visualizations of the ocean using novel gaming technologies have gained momentum as a non-traditional way to disseminate scientific results and engage with different audiences

(Steenbeek et al. 2021). Several initiatives exist[8,9,10] in the region and could be explored to visualize specific results of the ESRs (**recommendation #23**).

Finally, thinking outside of the discipline, the creation of alliances with institutions outside the research context, such as art foundations or art schools, could allow widening the audiences that could be informed about the ESR reports and science, while benefitting from a larger distribution (**recommendation #24**).

ToR 6. How can the ESRs maximize uptake into fisheries management decisions? (Obj2.2)

The success of the ESRs to influence the results of the recommendations from individual stock assessment authors with the use of the risk tables is an important achievement and should be maintained.

Building on it, efforts to influence the process "up" and "down" the pipeline may provide additional success. For example, the coordination of information to provide to the stock assessment authors at the beginning of the process, to directly advise the calculation of the Maximum Acceptable Biological Catch, could be explored. A joint workshop with the stock assessment authors and the ESR team could be an initial step to identify opportunities within this venue (**recommendation #25**). This workshop could allow identifying the key information needed by stock assessment authors to incorporate additional ecosystem considerations within their assessments.

The ESR team could also aim at presenting the summary risk table and trend analysis (**recommendation #1 and #2**) at the Groundfish Plan Teams (GPT) and Scientific and Statistical Committee (SSC) meetings, in addition to the Council meeting, with the aim to highlight the importance of considering ecosystem issues and evaluate previous attempts and results of doing so. Additional synthesis products identified in **recommendation #3** could be of interest in these meetings to bring a strategic perspective into the discussion, too. This include information about the food web dynamics, fishing dynamics, socioeconomic dynamics and mechanistic understanding and scenario development and testing.

Additionally, the EBFM toolbox in Alaska developed within NOAA AFSC potentially brings several collaborations that could be definitively explored and promoted. They include linking in a direct way to the Ecosystem & Socioeconomic Profiles (ESPs), the Climate-informed Ecosystem Models

[8] https://www.globaloceanmodelling.org/visualizations
[9] https://www.youtube.com/watch?v=5c2DwhViVtk
[10] https://www.fisheries.noaa.gov/resource/tool-app/virtual-ecosystem-scenario-viewer-ves-v

and MSEs, the Protected Species Catch Limits, Fishery Closures, Optimum Yield Caps, and Gear Modifications initiatives and the information generated by the Alaska Food Web Research initiative[11] (**recommendation #26**).

As already mentioned in ToR 2, to continue building a trusted partnership with the Council, the ESR team could develop tailored analyses on specific questions that the Council may have as a efficient way to provide answers to specific topics of interest.

ToR 7. What are the costs, benefits, and prioritization of new and/or additional ESR-related products? (Obj.2.3)

In previous sections, I identified twenty-six recommendations that are related to the products and workflow of the ESR. In the table below I have ranked them according to the cost, priority and targeted audience.

Table 1: Ranking of Recommendations Related to ERS Products and Workflow

Nº	Recommendations	Costs	Self serving	Community	Priority
1	Create a synthesis of risk tables	low	x	x	high
2	Generate a trend analysis of risk table uptake	low	x	x	high
3	Generate ecosystem information for strategic advice of the Council	medium	x	x	high
4	Automate ESR authors contributions workflow	medium	x		medium
5	Synthesise ESR involving a group of experts	medium	x	x	medium
6	Summarize implications of considering ecosystem elements in decision-making	medium		x	medium
7	Inform and educate Council on EAFM and EBFM	high		x	medium
8	Engage in tailored analyses for the Council	high		x	low
9	Identify products in the ESR to update annually from those to update every 2-4 years	low	x		high
10	Explore the pros and cons of bringing individual contributions to annex	low	x	x	high
11	Add a second figure to the report cards with zoom in the last 5 year information	low	x	x	high
12	Classify individual contributions that are necessary from those that are complementary	low	x		high
13	Allocate necessary individual contributions for the ESR to easy to access experts (e.g. experts at NOAA AFSC)	medium	x	x	high
14	Provide DOIs to ESR documents and data	low	x	x	high
15	Promote local community engagement through annual or b-annual ESR events	high		x	low
16	Create an online platform to give visibility to the ESR contributors	medium	x	x	medium

[11] https://www.fisheries.noaa.gov/alaska/science-data/alaska-food-web-research

17	Aware tokens of appreciation to all contributors, annually	low		x	high
18	Include summary of ESP results into the ESR	low		x	high
19	Add Earth Observation products (satellite and models) into ESR	medium	x	x	high
20	Team up with graduate programs for contributions to ESR	medium	x	x	medium
21	Add to the “In Briefs” the stocks (%) informed by the ESR and stocks (%) whose ABCs and OFLs were adjusted	low	x	x	high
22	Generate stand-alone infographics to visualize ESR results	medium		x	high
23	Develop dynamic visualizations of the ESR results	high		x	low
24	Create alliances with institutions outside the research context (e.g. art)	high		x	low
25	Inform stock assessment authors to calculate Maximum ABC	medium	x		high
26	Integrate information from the EBFM toolbox in the ESR	medium	x		high

Ten recommendations (in grey above) are highlighted as the first actions to undertake because they are identified as low costs and high priority. They are related to the content or the workflow of the ESR process and the involvement of individual contributors to the ESR. These recommendations could be the best way to proceed with current resources.

Six recommendations are identified as high priority and medium costs, and include actions to complement the content of the ESR with additional quantitative information and further invest resources in informing the fisheries management process. These could be tackle if moderate additional resources are available.

The remaining ten recommendations can contribute to broaden the capability of the ESR work to achieve general objectives and engage with a larger audience. They can be achieved if substantial personnel and financial resources are allocated to them.

Off all recommendations, 5 of them are identified as self-serving priorities and 8 are mainly community targeting priorities. The rest are both self-serving and community priorities.

Conclusions and Recommendations

Overall, I conclude that the ESRs have proven to be very useful in the fisheries management context of the region. The risk table applications by stock assessment authors are successfully used and are an important achievement. These efforts should continue and remain a priority of the ESR yearly process.

However, the overall contribution of the ESR has the potential to reach additional steps in the whole process and the scope and activities could be enlarged. The collection of data and contributions to the ESR report by individual contributors could be streamlined through the establishment of a protocol and automated workflow and routine. The process also leaves the editor the whole responsibility to integrate and prioritize the information received. This task shall be done within a group of people that represent different contributions to the ESR and the fisheries management process

The ESR team could intensify its activity around the Council with several initiatives, most notably, providing a summary of the implications of considering ecosystem elements in decision-making (for example, with a summary of the risk tables and a trend analysis of uptake by single stock assessments). It could also aim at informing and educating the Council members about the importance of considering ecosystem elements in fisheries management (when normal conditions happen) and how extreme events or changes can affect ecosystem relationships (mechanistic understanding of the changes). The development of tailored analyses on specific questions that the Council may have can also be a good opportunity to further engage with the Council.

The tight annual schedule of the fishing management process constrains the amount of information that the ESRs can produce every year to inform the Council. To maximize the exchange of information, one could separate those key products that need to be updated every year (to provide tactical advice, targeting stock-specific issues) from those that can be provided with a longer update period, such as every 2-4 years, that are most useful for strategic advice (targeting broader ecosystem health issues).

A classification between contributions to the ESR by authors that are necessary to achieve the main goals (priority 1) from those that are complementary (priority 2) could allow alleviating the ESR editors workload. Priority 1 contributions could originate from reliable sources that provide information with a quick turnover. According to the large expertise that NOAA AFSC researchers have in several key topics of the ESR, these contributions could originate primarily from NOAA AFSC researchers and close collaborators.

Emerging synthesis efforts may be interesting for some part of the scientific community contributing to the ESRs, and they could also be interested in the ESR documents and data being associated with a DOI that can be cited. It may be worth mapping the interests of community and non-scientist contributors to the ESR. Social gatherings to foster the communication of local communities participating in the ESR could be an activity to explore, in addition to the creation of

an online platform to give visibility to the ESR contributors. Contributors to the ESR could be awarded, every year, with tokens of appreciation (a formal certificate of contribution and a gift). Letters to institutions whose members are involved in the ESR could be issued yearly.

The ecosystem assessment of part 1 of the ESRs is currently descriptive. Efforts to bring in quantitative synthesis products could allow summarizing part 2 contributions, complement the report cards and bring value to the ESR, while generating interest for contributors to be involved in the synthesis phase. A list of potential quantitative synthesis products to include are (i) a summary of the risk tables and trend analysis, (ii) a summary of Ecosystem and Socio-Economic Profiles (ESP) results, (iii) a summary of spatial-temporal changes of key ecosystem components, drivers (environment and human activities), impacts and effects to ease the interpretation of stock and ecosystem dynamics, (iv) a summary of mechanistic understanding about the main environmental and fishing effects on the ecosystem structure and functioning, and how changes in the environment towards differential phases can affect specific ecosystem compartments, including commercial stocks, their prey and predators.

The analyses included in the ESR mostly rely on *in situ* observations from the most recent past. Additional analyses could be added if the developers of the ESRs take full advantage of the broad information that Earth Observation products (including satellite products) and ecological models have to offer. In this context, additional sources of information available at NOA AFSC could inform the ESRs bringing new insights into the document: (i) information about the food web interactions and dynamics, (ii) tradeoffs analyses and scenario developing and testing, considering environmental, ecological and economic issues, could be incorporated; (iii) ecosystem health indicators could have a specific section within the ESR synthesis part.

To increase the dissemination of the ESR, data access and availability, the association of a DOI to each report or the data generated could improve citations. Every year contributors to the ESR could receive a token of appreciation, such as an official certificate of contribution and a gift. Letters to institutions whose members are involved in the ESR could be also issued yearly. The creation of an online platform to give visibility to the ESR contributors could also contribute to the creation of a sense of ESR community and to disseminate results.

The generation of stand-alone infographics that can be downloaded from the website and that illustrate year status of the ecosystems could be useful. Dynamic visualizations of the ocean using novel gaming technologies as a non-traditional way to disseminate scientific results and engage with different audiences could be explored. Finally, the creation of alliances with institutions outside the research context, such as art foundations or schools, could allow widening the

audiences that could be informed about the ESR reports and science, while benefitting from a larger distribution.

Building on the success of the ESRs to influence the results of the recommendations from individual stock assessment authors with the use of the risk tables, efforts to influence the process "up" and "down" the pipeline may provide additional success. The coordination of key information to provide to the stock assessment authors at the beginning of the process to directly influence the calculation of the Maximum Acceptable Biological Catch could be explored. A joint workshop with the stock assessment authors and the ESR team could be an initial step to identify opportunities within this venue.

The ESR team could also aim at presenting the summary risk table and trend analysis at the Groundfish Plan Teams (GPT) and Scientific and Statistical Committee (SSC) meetings, with the aim to highlight the importance of considering ecosystem issues and evaluate previous attempts and results of doing so. Additional synthesis products could be of interest in these meetings to bring a strategic perspective into the discussion, too. Overall, the leading group of the ESRs is very capable and is doing a very fine job, but is faced with a major task every year. The core group involved in the ESRs development currently involves three researchers, with an effort level that corresponds to less than 3 person-years annually. I consider this personnel allocation insufficient for the successful development of the ESRs and the future improvement of the process. In this regard, it was not evident the mechanisms for how other researchers and initiatives at NOAA AFSC and other centres contribute to the ESRs. The EBFM toolbox in Alaska developed within NOAA AFSC could potentially bring several collaborations into the ESRs. They include linking in with the Ecosystem & Socioeconomic Profiles (ESPs), the Climate-informed Ecosystem Models and MSEs, the Protected Species Catch Limits, Fishery Closures, Optimum Yield Caps, and Gear Modifications initiatives and the information generated by the Alaska Food Web Research initiative, among others.

The work that is done annually within the Alaska Fisheries Science Center Ecosystem Status Reports for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska is a significant step on the way towards an Ecosystem-Based Fisheries Management and additional personnel and resources should be dedicated to this effort.

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Appendix 1: Bibliography of materials provided for review

ESR documents

Pre-review Background Documents included the Ecosystem Status Reports and In Briefs, versions 2021 and 2o22. These are:

- 2022 Ecosystem Status Report – Eastern Bering Sea
- ESR EBS In Brief
- 2022 Ecosystem Status Report – Gulf of Alaska
- ESR GOA In Brief
- 2022 Ecosystem Status Report – Aleutian Islands (survey year)
- ESR AI In Brief
- 2021 Ecosystem Status Report – Gulf of Alaska (survey year)
- ESR GOA In Brief
- 2021 Ecosystem Status Report – Aleutian Islands
- ESR AI In Brief

We also ask that they watch the video Alaska's Ecosystem Status Reports: A Collaborative Approach to Inform Fisheries Management, posted under the 2021 reports and also found here Examples of risk tables in stock assessments available. Risk tables in stock assessments (primarily the ecosystem considerations sections, which are informed by ESRs) for stocks found in each Large Marine Ecosystem, for example:

Data-rich stocks:

- Gulf of Alaska Walleye Pollock
- Eastern Bering Sea Pacific Cod

Data-poor stocks:

- Gulf of Alaska Demersal Shelf Rockfish
- Aleutian Islands Northern Rockfish
- Eastern Bering Sea Kamchatka Flounder

Background Readings

Three peer-review publications were provided:

- Dorn, M., and Zador, S.G., 2020. A risk table to account for concerns external to stock assessments when developing fisheries harvest recommendations. Ecosystem Health and Sustainability. 6 (1):1-11

- Barbeaux, S. J., K. Holsman, and S. Zador. 2020. Marine heatwave stress test of ecosystem-based fisheries management in the Gulf of Alaska Pacific cod fishery. Frontiers in Marine Science 7:703.
- Zador, S. G., K. K. Holsman, K. Y. Aydin, and S. K. Gaichas. 2017. Ecosystem considerations in Alaska: the value of qualitative assessments. ICES Journal of Marine Science **74**:421-430.

Presentations for Review

Day 1. Subject Presentations

Presentation	Presenter
History of ESRs	Stephani Zador
ESR Process (timeline, onramps, presentations, schedule)	Stephani Zador
ESR content (where information comes from, what's similar among the ESRs)	Elizabeth Siddon
EBS ESR unique attributes and how that might impact management	Elizabeth Siddon
AI ESR unique attributes	Ivonne Ortiz
GOA ESR unique attributes	Bridget Ferriss
Data contributors: challenges, data management, timelines, examples	Ivonne Ortiz
ESRs in other regions: NEFSC	Sarah Gaichas
ESRs in other regions: NW/SWFSC	Chris Harvey
Council uses and needs: SSC perspective	Franz Mueter / UAF, NPFMC SSC
Council uses and needs: Council perspective	Diana Evans/NPFMC
Risk tables and SA author interactions, what's changed since Dorn & Zador 2020	Stephani Zador
Ecosystem and Socio-economic Profiles -	Kalei Shotwell
Non-Council uses of ESRs: Academia, public, communities, examples and pros/cons of expanding, including trade-offs,	Bridget Ferriss

ESR communication and outreach	Elizabeth Siddon / Maggie Mooney-Seus

Day 2. Terms of Reference: short presentations with questions and discussion time

Presentation	Presenter
Should the ESR continue to tailor efforts to inform the ABC and OFLs?	Stephani Zador
How can the function of the ESR team better meet the Council's needs?	Elizabeth Siddon
How can the ESRs better meet the needs of the contributing scientists and other knowledge holders?	Bridget Ferriss
How can the way the ecosystem science is selected, incorporated, and synthesized in the ESRs be improved?	Ivonne Ortiz
How can the process of disseminating the information in the ESRs be improved?	Bridget Ferriss
How can the ESRs maximize uptake into fisheries management decisions?	Elizabeth Siddon
What are the costs, benefits, and prioritization of new and/or additional ESR-related products?	Ivonne Ortiz

Day 3. Reviewer writing session only

Appendix 2: Performance Work Statement

Performance Work Statement (PWS)

National Oceanic and Atmospheric Administration (NOAA)
National Marine Fisheries Service (NMFS)
Center for Independent Experts (CIE) Program
External Independent Peer Review

Review of the Alaska Fisheries Science Center Ecosystem Status Reports for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska

Background

The National Marine Fisheries Service (NMFS) is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available (BSIA). NMFS science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external scientific peer reviews have been and continue to be essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These expert(s) must conduct their peer review impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards[12].

Scope

The Alaska Fisheries Science Center produces three Ecosystem Status Reports (ESRs) annually to provide ecosystem information for the North Pacific Fishery Management Council (Council). These reports are tailored toward supporting the Council's annual process to set groundfish harvest specifications. The reports specifically inform the setting of Acceptable Biological Catch (ABC) and Over Fishing Levels (OFL) through two primary pathways: by informing stock assessments' risk tables and by providing context for discussion by council committees that make the final ABC and OFL determinations. Both pathways can be used to support decisions to keep or reduce the recommended maximum ABC from each stock assessment model. ESRs are disseminated along with the stock assessments, and ESR presentations are given to numerous council committees annually during the fall groundfish quota-setting process.

The effectiveness of the ESRs relies on timely production to maximize uptake into fisheries management decisions. Specifically, ESRs are produced at the same time as the stock assessments in order to use the most current data to inform the annual harvest specifications.

[12] https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/memoranda/2005/m05-03.pdf

The ESRs also serve as an on-ramp for ecosystem and climate research to get into the Council review process. While Alaska is known for having data-rich stocks, there are also many data-poor stocks which are also managed by the Council. The ESRs provide an important source of contextual ecosystem information for stocks for which there are limited available data. The ESRs are also used or referenced outside of the groundfish harvest specification process. For example, ESR presentations are given to the Council's eastern Bering sea crab specification process. Other examples include informing research gaps/priorities, identification of new indicators, and informing policy needs of the NOAA Fisheries Alaska Regional Office.

The objectives in seeking this review are two-fold. First, we seek a review of the goals of the ESRs. Second, we would like feedback on how best to meet these goals.

Objective 1: Are the ESRs' goals to inform the development of ABC and OFL still appropriate or should the goals be broadened? The advantages of staying focused on ABCs and OFLs include having a narrowly-defined, targeted on-ramp for ecosystem science into the Council process that helps define the timing, interpretation, and communication of the reports. Challenges of the narrow focus include a limitation of the application of ESRs to other Council decisions, and limited application to other interested parties outside of the Council process (e.g., industry, local communities, Tribes).

Objective 2: How can we better achieve these ESRs goals? This objective can be divided into multiple subcomponents:

5. A review of the content of the reports, specifically how the ecosystem science is selected, incorporated and synthesized.
    a. How data and indicators are selected, developed, and displayed.
    b. The structure of the reports
    c. The balance of information across the reports and web content
6. A review of the process of how the reports are disseminated in the council process.
    a. Timing and number of presentations, balancing crowded agendas with ESR presentations.
    b. Integrating ESRs in the stock assessment development and harvest specification process (communication with individual stock assessment author, Groundfish Plan Team, and Council)
    c. The use of stock-specific risk tables to directly connect ESRs to the maximum ABC recommendation
7. A review of the ESRs role in an evolving ecosystem information space as new data needs, capabilities, and products are developed.
    a. Balance of ESRs with stock-specific Ecosystem and Socio-Economic Profiles (ESPs) and longer-term Fishery Ecosystem Plans in communicating ecosystem information to the Council.
    b. Integration of climate information, model-based products, forms of risk assessments, social and economic information, etc.
8. A review of ESR staff organization
    a. Costs and benefits of ESR staff in multiple or one program.

The specified format and contents of the individual peer review reports are found in **Annex 1**. The Terms of Reference (TORs) of the peer review are listed in **Annex 2**. Lastly, the tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements

NMFS requires 3 reviewers to conduct an impartial and independent peer review in accordance with this Performance Work Statement (PWS), OMB Guidelines, and the ToRs below. The reviewers shall have working knowledge and recent experience in incorporating ecosystem information into fisheries management decisions and using or producing ecosystem assessments for fisheries managers. Some expertise with ecosystem indicators is essential. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.
The chair, who is in addition to the three reviewers, will be not be provided by the CIE. Although the chair will be participating in this review, the chair's participation (i.e. labor and travel) is not covered by this contract.

Tasks for Reviewers
Deliverables herein.

6. Pre-review Background Documents: Review the following background materials and reports prior to the review:

All of the Ecosystem Status Reports can be found at this url: https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands#2018 At present, the latest versions available are from 2021. We request the reviewers to familiarize themselves with the three 2022 reports and read the In Brief pamphlets, which will be posted by January 2023. We also request the reviewers to familiarize themselves with the 2021 reports for the Gulf of Alaska and the Aleutian Islands to compare the impacts of alternating trawl survey years on data availability in these two large marine ecosystems. These are:

2022 Ecosystem Status Report – Eastern Bering Sea
ESR EBS In Brief
2022 Ecosystem Status Report – Gulf of Alaska
ESR GOA In Brief
2022 Ecosystem Status Report – Aleutian Islands (survey year)
ESR AI In Brief
2021 Ecosystem Status Report – Gulf of Alaska (survey year)
ESR GOA In Brief
2021 Ecosystem Status Report – Aleutian Islands
ESR AI In Brief

We also ask that they watch the video Alaska's Ecosystem Status Reports: A Collaborative Approach to Inform Fisheries Management, posted under the 2021 reports and also found here:
https://players.brightcove.net/659677166001/4b3c8a9e-7bf7-43dd-b693-2614cc1ed6b7_default/index.html?videoId=6287018070001

Regarding stock assessment risk tables, we ask that they read:
Dorn, M., and Zador, S.G., 2020. A risk table to account for concerns external to stock assessments when developing fisheries harvest recommendations. Ecosystem Health and Sustainability. 6 (1):1-11

Examples of risk tables can be found in stock assessments available here: https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessments-and-fishery-evaluation. We ask that they review some risk tables in stock

assessments (primarily the ecosystem considerations sections, which are informed by ESRs) for stocks found in each Large Marine Ecosystem, for example:

Data-rich stocks:
Gulf of Alaska Walleye Pollock
Eastern Bering Sea Pacific Cod

Data-poor stocks:
Gulf of Alaska Demersal Shelf Rockfish
Aleutian Islands Northern Rockfish
Eastern Bering Sea Kamchatka Flounder

7. Attend and participate at the review meeting. The meeting will consist of presentations by NOAA and other scientists, stock assessment authors and others to facilitate the review, to answer any questions from the reviewers, and to provide any additional information required by the reviewers.
8. After the review meeting, reviewers shall conduct an independent peer review report in accordance with the requirements specified in this PWS, OMB guidelines, and TORs, in adherence with the required formatting and content guidelines; reviewers are not required to reach a consensus.
9. Each reviewer should assist the Chair of the meeting with contributions to the summary report.
10. Deliver their reports to the Government according to the specified milestones dates.

Foreign National Security Clearance
When reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for reviewers who are non-US citizens. For this reason, the reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30-50 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Foreign National Guest website. The contractor is required to use all appropriate methods to safeguard Personally Identifiable Information (PII).

Place of Performance
Each reviewer shall conduct an independent peer review during the panel review meeting scheduled in Seattle, WA or virtually dependent on conditions of the COVID 19 pandemic during the following dates: Feb 28, March 1-2

Period of Performance
The period of performance shall be from the time of award through April 2023. Each reviewer's duties shall not exceed 14 days to complete all required tasks.

Schedule of Milestones and Deliverables: The contractor shall complete the tasks and deliverables in accordance with the following schedule.

Schedule	Milestones and Deliverables

Within two weeks of award	Contractor selects and confirms reviewers
Two weeks prior to the panel review	Contractor provides the pre-review documents to the reviewers
Feb 28, March 1-2, 2022	Each reviewer participates and conducts an independent peer review during the panel review meeting
Within two weeks of the panel review meeting	Contractor receives draft reports
Within three weeks of receiving draft reports	Contractor submits final reports to the Government

*The Chair's Summary Report will not be submitted to, reviewed, or approved by the Contractor.

Modifications to the Performance Work Statement
Each reviewer will write an individual review report in accordance with the PWS, OMB Guidelines, and the TORs below. Modifications to the PWS and ToRs cannot be made during the peer review, and any PWS or TORs modifications prior to the peer review shall be approved by the Contracting Officer's Representative (COR) and the CIE contractor. The PWS and TORs shall not be changed once the peer review has begun.

Applicable Performance Standards
The acceptance of the contract deliverables shall be based on three performance standards: (1) The reports shall be completed in accordance with the required formatting and content; (2) The reports shall address each TOR as specified; and (3) The reports shall be delivered as specified in the schedule of milestones and deliverables.

Travel
All travel expenses shall be reimbursable in accordance with Federal Travel Regulations (http://www.gsa.gov/portal/content/104790). International travel is authorized for this contract. Travel is not to exceed $10,000.

Restricted or Limited Use of Data
The contractors may be required to sign and adhere to a non-disclosure agreement.

NMFS Project Contact(s)

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Peer Review Report Requirements

1. The report must be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The report must contain a background section, description of the individual reviewers' roles in the review activities, summary of findings for each TOR in which the weaknesses and strengths are described, and conclusions and recommendations in accordance with the TORs.

   a. Reviewers must describe in their own words the review activities completed during the panel review meeting, including a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each TOR even if these were consistent with those of other panelists, but especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the summary report that they believe might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The report shall represent the peer review of each TOR, and shall not simply repeat the contents of the summary report.

3. The report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of this Performance Work Statement
   Appendix 3: Panel membership or other pertinent information from the panel review meeting.

Terms of Reference for the Peer Review

Review of the Alaska Fisheries Science Center Ecosystem Status Reports for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska

CIE reviewers are contracted to complete their independent peer review based on the ToRs. Therefore, the CIE-NMFS review and approval process is based on whether the CIE independent reports addressed each ToRs.

1. Should the ESR continue to tailor efforts to inform the ABC and OFLs? (Obj.1)
2. How can the function of the ESR team better meet the Council's needs? (Obj.1, Obj.2.3)
3. How can the ESRs better meet the needs of the contributing scientists and other knowledge holders? (Obj.1, Obj.2.3)
4. How can the way the ecosystem science is selected, incorporated, and synthesized in the ESRs be improved? (Obj2.1)
5. How can the process of disseminating the information in the ESRs be improved? (Obj2.2)
6. How can the ESRs maximize uptake into fisheries management decisions? (Obj2.2)
7. What are the costs, benefits, and prioritization of new and/or additional ESR-related products? (Obj.2.3)

Tentative Agenda

Review of the Alaska Fisheries Science Center Ecosystem Status Reports for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska Feb 28, March 1-2, 2023

February 28
0900 Introductions and logistics
0930 Overview presentation: process, products, and presentations
1000 Eastern Bering Sea ESR
1100 Break
1115 Aleutian Islands ESR
1215 Lunch
1330 Gulf of Alaska ESR
1430 break
1445 Ecosystem and Socioeconomic Profiles
1500 Risk tables in stock assessments
1600 Council presentation
1700 End

March 1
0900 Review agenda
0915 Ecosystem indicator contributors
1030 Break
1045 Synthesis section contributors, including climate change task force
1200 Lunch
1330 ESR process presentations and discussion

1700 End

March 2
0900 Reviewer question and writing period
1200 Lunch
1330 Reviewer question and writing period
1700 End

Appendix 3: Panel membership

List of ESR CIE Review attendees for Tuesday February 28 and Wednesday March 1, 2023

CIE review panel:
Stephani Zador, Chair, (NOAA Fisheries, AFSC),
Marta Coll Montón, (CIE)
Matthew Cieri, (CIE)
Yan Jiao, (CIE)

Ecosystem Status Reports Team:
Stephani Zador (NOAA Fisheries, AFSC)
Elizabeth Siddon (NOAA Fisheries, AFSC)
Ivonne Ortiz (NOAA Fisheries, AFSC)
Bridget Ferriss (NOAA Fisheries, AFSC)

Other presenters:
Chris Harvey (NOAA Fisheries, NWFSC)
Diana Evans (NPFMC)
Franz Mueter (SSC, NPFMC)
Kalei Shotewell (NOAA Fisheries, AFSC)
Sarah Gaichas (NOAA Fisheries, NEFSC)

Other participants:
Alex Andrews
Anne Vanderhoeven
Austin Eastenbrooks
Dana Hanselman
Emily Fergusson
Jacek Maselko
Jim Ianelli (NOAA Fisheries, AFSC)
Kerim Aydin (NOAA Fisheries, AFSC)
Lisa Eisner
Maggie Mooney-Seus
Ron Felthoven
Sara Cleaver
unknown caller