Independent peer review report --- Review of the Alaska Fisheries Science Center Ecosystem Status Reports for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska

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From February 28-March 2, 2023, the Alaska Fisheries Science Center (AFSC) underwent a review of their Ecosystem Status Reports (ESRs) for the Eastern Bering Sea (EBS), Aleutian Islands (AI), and Gulf of Alaska (GOA). **The review, conducted by a CIE panel, aimed to evaluate the goals of the ESRs and provide feedback on how to achieve them.** "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." (Appendix 2). The review also aims to ensure that the ESR represents the best available science and that any deficiencies are identified and addressed.

The Terms of References (TORs) for the peer review (Appendix 2) outlined the topics for discussion between the CIE review panel and the ESR team members. During the review process, the two groups and the other participants engaged in discussions on the current status, objectives, and processes of the ESRs, the challenges they face, and potential feedback from the CIE reviewers. These discussions allowed for a comprehensive evaluation of the ESRs and helped identify areas that may be improved or considered.

Main findings

Since 2020, the ESRs and Risk Tables based on ESR ecosystem considerations have played a significant role in the North Pacific Fishery Management Council (NPFMC) fisheries management process. Zador et al. (2017) and Dorn and Zador (2020) demonstrated the applications of the ESRs and Risk Tables in this process. The Risk Tables were developed for fully assessed species each year since 2020. Overall, the ESRs and Risk Tables have proven to be valuable tools for informing and improving the management of fisheries in the North Pacific region.

In light of my understanding of the ESRs, their goals, and the objectives of the peer review process, I strongly support the use of the ESRs and Risk Tables as the best available science and the ecosystem considerations suggested in the Risk Tables being used for fisheries management purposes. I recommend that these considerations continue to be reviewed by stock assessment teams and the Scientific and Statistical Committee (SSC) to ensure their accuracy and reliability. Furthermore, the ESR recommended ecosystem changes are suggested to be considered in the single species stock assessment whenever possible. If this is not feasible, it would be reasonable to consider these changes in the ABC determination process based on the Risk Table developed by ESR. This approach would be consistent with the existing stock assessment, harvest control role, and fisheries management processes of the AFSC and NPFMC, as outlined in DiCosimo et al. (2010). It is important to note that my recommendation does not preclude future revisions to the OFL, ABC, and risk level

determination processes. Rather, **it is intended to provide suggestions on the best use of the ESRs and Risk Tables in the current context of fisheries management in the North Pacific region.**

Main recommendations

There are no disagreements on comments and recommendations between the CIE panel and me. Below I include the major recommendations I agree with the CIE panel and additional comments and suggestions from myself.

- While I believe that the current goals of the ESRs to inform the development of ABC and OFL are appropriate, I recommend that they be broadened over time to include additional considerations of ecosystem modeling development, education, and outreach.
- I recommend that the ESRs maintain consistency in the indicators and types of information included in ESRs while remaining open to new data and information contributions. This will facilitate the ESRs' role as an evolving ecosystem information space. Consistency in the ESRs is important not only for the reports themselves but also for the management considerations that rely on the information presented. Some indicators or data can be placed on a website as appendices. This will ensure that interested parties can always access the information they need.
- While maintaining consistency, it is also reasonable to highlight emerging important or new phenomena that may have a broad impact on the LMEs.
- Automating the data and contributors' input is important and can be treated as a short-term priority, which may be done through a team effort across the three ESRs. This effort may require significant resources and time in the short term, but it can provide significant benefits in the long term by freeing up time for the ESR team to focus on other priorities and tasks, such as synthesis and analysis, collaborations with ESP and climate modelling teams and communications with NPFMC and SSC.
- The Briefs, Report Cards, Noteworthy topics, and Risk Tables are informative and effective as outreach material. Further links to video talks or PPT slides to SSC and Council should facilitate better outreach opportunities for the public.
- Linking the figures and tables in the ESRs to a data hub or repository would greatly benefit the broader application of ESR and ecosystem-based model development. It would allow for easier access to the data and facilitate collaboration among different teams and enhance transparency and reproducibility.
- The review panel encourages adding the diet or food-web analysis, which may be added as appendices if not immediately used for management purposes. Such information should facilitate multi-species modelling with different complexities over time.
- Extra staff support seems needed to broaden the goals and functions of ESRs. It would ensure the ESR team has the necessary resources to undertake these tasks effectively.

1. BACKGROUND

The 2023 Review of the Alaska Fisheries Science Center (AFSC) Ecosystem Status Reports (ESRs) for the Eastern Bering Sea (EBS), Aleutian Islands (AI), and Gulf of Alaska (GOA) was conducted by a CIE review panel. The review was in person and was from Feb 28-March 2, 2023. **The review panel is expected to review the goals of the ESRs and provide feedback on how best to meet these goals.** "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." (Appendix 2).

The review also aims to ensure that the ESR represents the best available science to date and that any deficiencies are identified and addressed. The ESR review Chair from AFSC, Dr. Stephani Zador, provided all the background information, documents, and further reference papers to the CIE review panel. The meeting was available to the public either in person or virtually. The CIE review panel members include Drs. Marta Coll, Matthew Cieri, and Yan Jiao (me).

At the beginning of Feb 28, Dr. Stephani Zador presented the logistics, history of ESRs, and ESR processes. Drs. Elizabeth Siddon, Bridget Ferriss, and Ivonne Ortiz then presented the ESRs done by the AFSC Ecosystem status team. Their presentations also included data contributions, ESR's unique contributions to fisheries management, and the development of Risk Tables (Dorn and Zador 2020), discussed among reviewers and meeting participants. North Pacific Fishery Management Council (NPFMC) council staff Dianna Evans and Scientific and Statistical Committee (SSC) member Dr. Franz Mueter gave presentations on how the ESRs and Risk Tables contribute to the stock assessment and fisheries management processes. Dr. Kalei Shotwell also presented the ecosystem and socio-economic profiles (ESP) program based on its processes and contributions to fisheries management and clarified the overlap and unique characteristics and functions in ecosystem considerations in fisheries management (see tentative agenda in Appendix 2). Drs. Sarah Gaichas and Chris Harvey from Northeast Fishery Science Center (NEFSC) and Northwest Fishery Science Center (NWFSC) presented ESRs in their working regions.

According to Dr. Zador, the ESR started in 1995 and was revised yearly in response to Council reviews and new information (Zador et al. 2016). The document becomes more extensive over time and tailored to the Council. The current ESRs annual process is closely linked to the stock assessment cycle; the major goals of the ESR are to inform the development of ABC and OFL. The ESR overview the ecosystem status in the GOA, AI, and the EBS and deliver their findings to the stock assessment team, the GPT (Groundfish Plan Team), and the SSC and Council (Figure 1). The Risk Tables were developed for the fully assessed species yearly since 2020. Their findings in trends help the assessment team to include and consider the ecosystem changes in the single species stock assessment models, such as guiding the modelling of the changes in the life history parameters or processes and other ecosystem-enhanced model

development. The ESRs and Risk Table also provide evidence for the GPT and SSC to adjust ABC beyond the existing harvest control rules used in the NPFMC. The ESR findings also help the Council to identify potential research priorities. The use of the ESR by the assessment team and NPFMC is expected to be improved over time by better communications and practices of ESR in stock assessment and the Council's fisheries management decision-making.

Discussions on the seven Terms of References (TORs) were set on the second day, March 1, one by one. The participants include members of the stock assessment team, the ESP, other NOAA ecosystem-related modelling teams, and NPFMC council staff. Their participation largely helped clarify questions from the CIE review panel and facilitated the discussions on the TORs.

Although there are some concerns and challenges on the ESR process, goals, and expectations, the content and material included, the contributions of ESR in the NPFMC's fisheries management through ABC determination and other ecosystem-based modelling and management, ESR products have been recognized by the review panel. The review panel recommended potential approaches to enhance the ESR goals in informing ABC in fisheries management and other broader goals such as ecosystem-based modelling, education, and public outreach.

As a review panel member, I was provided with ESRs and their briefs and web access to relevant ESR videos and publications (see Appendix 1 for a full list of documents), and I participated in the ESR review meeting. The review process followed the tentative agenda and the TORs. During the review meeting, the AFSC ESR team was always available when required for further discussion, and additional documents to help understand and clarification of the ESRs and Risk Table applications were provided.

As a CIE reviewer, my duty was to evaluate the AFSC ESR reports, the Risk Tables in the OFL and ABC discussions and determinations, the general ESR goals, and how to better meet these goals with respect to TORs, and work with the CIE review panel Chair and other members to prepare a panel summary report. This report provided the findings and recommendations of the independent review that is undertaken by me following the CIE Performance Work Statement (PWS).

2. ROLE OF INDIVIDUAL REVIEWER IN THE REVIEW ACTIVITIES

My role as a CIE independent reviewer was to conduct an impartial and independent peer review in accordance with the PWS and the predefined TORs herein.

About 10 days before the review meeting, the assessment documents and supporting materials were made available to the review panel via a website by Dr. Stephani Zador. I read all the documents and viewed the suggested videos that I received before the review.

The AFSC ESR 2023 peer review meeting followed the “Tentative agenda (Appendix 2)” of the CIE review. The meeting was open to the public and was organized constructively. During the meeting, all the documents were accessible online through Google drive or emails.

Presentations were given during the review according to the agenda to provide the CIE panel with background information on AFSC ESRs, how ESRs are applied and distributed, and how they are fitted to the NPFMC’s fisheries management process. The ESR team and the review panel then moved to the TOR discussion accordingly. I was actively involved in the discussion during the presentations by 1) listening to the presentations carefully, making notes on the points that were not included or not clearly stated in the documents provided prior to the meeting; 2) asking questions for clarification on the TORs and the ESR reports and application of the reports and Risk Tables; 3) making comments and providing possible alternative solutions to questions arising during the meeting; 4) discussing agreements on each TOR with the other review panel members.

On the last day of the peer review meeting, the CIE review panel discussed our thoughts on the ESR based on TORs and how to prepare the panel summary report together. This review report is formatted according to my interpretation of the required format and content described in Appendix 2.

3. SUMMARY OF FINDINGS RELATIVE TO TORs

Based on my understanding of the ESR process, goals, and review objectives, I support the ESRs as the best available science, and its suggested ecosystem considerations in the Risk Table continue being used for fisheries management purposes under the review of the stock assessment teams and SSC. It is crucial that the stock assessment teams, and SSC regularly review and integrate these ecosystem changes in the single species stock assessment wherever possible. If this is not feasible, it is reasonable to consider the ecosystem changes in the ABC revision process (decrease from maxABC estimated based on stock assessment and existing control rule) based on the Risk Table developed by the ESR team. The Risk Table is a useful tool that aligns with the AFSC and NPFMC's existing stock assessment, harvest control role, and fisheries management processes. I recommend using it to guide the ABC revision process while remaining open to potential future revisions to the OFL, ABC, and risk level determination processes.

Below I provide the summary of findings for the AFSC ESR review, in which the weaknesses and strengths are described in accordance with the TORs.

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

The review panel found it reasonable to continue to tailor efforts to inform the ABCs and OFLs. The presentations to SSC may be crafted to meet the need of the

species discussed and the SSC's ABC recommendations. The ESR may collect feedback from SSC and Council over time to better schedule conversations and optimize the processes. I recommend a small group meeting among the ESR, stock assessment species lead, a GPT representative, and the SSC species lead or SSC representatives so that key information from ESR is selected and conveyed to SSC at the right time.

The review panel suggested that the goals should be broadened over time with considerations of ecosystem modelling development, education, and outreach. The advantages and disadvantages of expanding focus were discussed. Although the ESR's main objective has evolved to inform ABC, the team has plenty of opportunities to connect with alternative contributors, which provides great outreach opportunities. The existing team also offers other presentations and provides alternative media and files for many users.

The review panel suggested that the trade-offs of the Total Allowable Catch (TAC) among species and bycatch may be considered in the future ESR material. Whether the resources of information are enough for the trade-off analysis and whether the ESR lead should synthesize it was discussed. The ESR may provide information and the synthesized results to other working groups involving the assessment team, GPT, Fishery Ecosystem Plan (FEP), etc., to further synthesize or analyse it before being considered by SSC and Council.

The review panel suggested maintaining consistency of the indicators and the types of information included in the ESR and always being open to new data and information contributions. The information consistency should facilitate ESRs as an evolving ecosystem information space. To avoid the report getting too lengthy, some indicators or data can be put on a website as appendices so that people interested in using some indicators can always find them over time. **Such consistency also provides consistency in management considerations.**

While maintaining consistency, it is also reasonable to highlight emerging important or new phenomena that may have a wide LME impact. The current ESRs have been doing this successfully and have been reflected in fisheries such as GOA pacific cod.

Clarifying each working group's tasks related to the ESR team and automating the data and contributors' input is important. It can be treated as a short-term priority, which may be done through a team effort across the three ESRs. Such effort may be high in the first couple of years but will save lots more effort for the ESR team to change focus to other priorities and tasks, such as collaborations with ESP and climate modelling teams and communications with NPFMC and SSC. Such collaboration may save effort or avoid overlap of workload.

It is reasonable to me that the focus may change over time. A discussion among ESR, ESP, SSC, GPT, and assessment team about the potential focus changes

seems useful because more data/information will be cumulated, the ESR data input and report generating will be more autonomous, and the stock assessment models will change over time to include more ecosystem considerations.

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

The review panel suggested that the ESR may look back to see the ecosystem indicators that influenced the groundfish population dynamics, reflected ecosystem changes, the Risk Tables being used, and the feedback from the SSC and Council. The review panel also suggested that the trade-offs among species over time may be considered under historical ecosystem changes, food webs, and economic considerations. Such trade-off revisits and analysis may further help Council in species TAC allocation. For example, the ESR may not have enough staff to systematically analyze trade-offs among species. Still, ESR may provide a list of possible trade-off recommendations based on historical observations and the current ecosystem status, which can then be analyzed in depth by an alternative research team, such as FEP, an external research project, or a new task force.

The current ESR's major goals are to inform the development of ABC and OFL and help interpret the ABC changes (mainly reduction from the max ABC based on the control rules). The presentations to SSC may be crafted to meet the need of the species to be discussed. The ESR may collect feedback from SSC and Council over time to better schedule conversations and optimize the processes. I recommend a small group meeting before the SSC meeting. The small group meeting can be among the ESR, stock assessment species lead, a GPT representative and the SSC species lead or SSC representatives so that key messages from ESR can be conveyed to SSC at the right time.

The ESR team has been communicating with the stock assessment team so that the observed and/or predicted ecosystem changes can be incorporated into the stock assessment step, and the ABC reduction is unnecessary. Such conversation should continue. When the ecosystem changes cannot be included in the stock assessment, the conversation between ESR and GPT, and SSC becomes important. The Risk Table becomes important during the SSC meeting. Different cases for different species may be itemized during the conversation, which should help to meet Council needs.

The ESR may help Council's public scoping and outreach needs. I found the report cards, briefs, noteworthy sections in the reports, and the short videos on the website to be quite useful and supportive of the ecosystem application in fisheries management. Some outreach material may be released in tiers to meet Council, AP, and public education in different education and interest degrees. Presentations of the ESR team to different entities may also be included on the website to help further understand the ecosystem changes in Alaska and whether and how they are considered in the management process.

The ESRs also suggest research priorities or identify research needs. Such suggestions should be communicated with Council so that such research needs can be addressed by Council or external research sources.

The review panel members also wondered about the diet and food-web analysis and historical catch and effort information which were not included in the recent ESRs but can be informative for fisheries management (Barbeaux et al. 2020). Such information was included in the past but hadn't been used by the assessment team and SSC, so it was removed in recent years. The ESR may work with ESP to synthesize such data and add corresponding sections in the future. They may be included as web sources rather than in the annual reports. Such diet analyses should help fisheries management in the long run, although they may not be considered in the near future.

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

The contributors are diversified, mainly from NOAA, other federal and state agencies, and research institutes; some are from NGOs and tribes. It is important to clarify what they need and how to recognize their contributions. Letter or email to explain how the data or contributions being used and helped # of stock assessments and ecosystem status evaluation. ESR team should appreciate and encourage long-term collaboration and data sharing. If possible, virtual and in-person meetings may be organized annually to meet some of the contributors in turn.

I think it is important to have the contributors engaged and committed. It is important to be clear when and how their contributions are expected and try to create an autonomous inputting path so that the contributors feel committed and easy to follow each year.

The potential data input may be categorized based on types, temporal scale, and automated, such as numerical, qualitative, figures, text, stories, etc. They may be further classified based on expectations on whether long-term contributions and timelines of their contributions meet the ESR process's intensive workflow each year. Over time, ESR may automate old contributors, and ESR efforts can focus more on new contributors and further synthesis and analysis.

There are sometimes mismatches between what the contributors want (maybe local ecosystem questions, local fisheries, or pertinent questions) and the ESR's goals. It is important to explain how their contributions are used in the short and long run. It should be useful if the ESR can bridge the contributors to other teams or agencies to answer or solve their pertinent concerns.

There were discussions on the potential finer scale data portal being shared rather than just the ESR reports. The ESRs now have the contributors' contacts for readers to secure the data. In the future, the ESRs may develop their own data portal to allow the contributions being widely used for other roles of the ESRs, and avoid limitations of the ESR applications to other Council decisions and other interested parties such as industry and local communities and tribes.

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

The information consistency should facilitate ESRs as an evolving ecosystem information space. Such consistency also provided consistency in management considerations. I recommend maintaining consistency of the indicators and the types of information included in the ESR and always being open to new data and information contributions. To avoid lengthy reports, some indicators or data can be put on a website as appendices so that people interested in using some indicators can always find them over time.

While maintaining consistency, it is also reasonable to highlight emerging important or new phenomena that may have a broad LME impact.

Clarifying short-term and long-term applications, goals, and objectives is important. For example, the short-term objectives include providing indicators and Risk Tables to inform ABC and OFL. Data automation can be a short-term task with ESR objectives pertinent to ABC consideration but also benefit long-term service of the ESR to AFSC and NPFMC. While in the long run, the new information input and organization can be the tasks, and broader ecosystem goals are reasonable and applicable.

While synthesizing the historical observations on oceanography, CPUE, and life history of marine organisms, projections of how these observations may change in the future are also important if they can be done. The example of EBS projected climate change is an example in the report. The synthesis of the drivers that largely influenced the Alaska ecosystem changes or population dynamics should also help future ecosystem-based fisheries management.

The review panel also recommends the inclusion of spatial-temporal changes in fishing efforts, harvest, and CPUE in the future. Including diet analysis or information for multi-species dynamics analysis is also encouraged during the discussion. Such data inclusion may require a strategic plan according to the participants' previous experience in the review.

Comparison across the GOA, AI, and EBS ecosystems helps better understand the large marine ecosystem changes. Plots with the three LMEs together can be very useful in illustrating ecosystem changes.

The ESR team indicated concerns about leading editors making decisions about driving indicator processes. The consistency of the included indicators is important, and some can be shared as web appendices. I also recommend a meeting with the assessment team, climate team, GPT, and SSC every couple of years to ease such concerns in the future and build confidence for the reports to be published. The current indicator selection and recommendation in the annual report are because of the goals of informing the development of ABC and OFL, which is reasonable to me if the others not included can be available online.

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

The documents and presentations can differ depending on the target audience and users. The review panel praised the briefs, report cards, and noteworthy topics, which primarily facilitate disseminating the information in the ESRs before and after thoroughly reading the reports. The review panel recommends adding links to presentations beyond briefs and full reports to the ESR website so that different audiences can find different layers of knowledge with different interests and educational backgrounds. The review panel feels that these disseminating products should improve the potential for ESR to attract funding and support from both NOAA and external funding sources.

The review panel agrees that a data repository managed or accessed by the ESR should help the dissemination process beyond its broader potential for alternative user groups interested in ecosystem-based models and management.

The review panel recommended interactive tools and maps may be developed in the future so that users and readers can see how the indicators or observations change over time and space (Steenbeek et al. 2021). Dr. Coll provided examples of https://www.observadoresdelmar.es/Map, and https://www.fao.org/state-of-fisheries-aquaculture/en/ during the meeting.

The ESR indicated that their existing outreach effort had increased the number of contributions from tribes, for example. Sometimes, there are mismatches between contributors' expectations and ESR output or what ESR can do. Communication on how their contributions is used and other related data are used and interpreted may build trust over time and eventually help fisheries management.

Although the meeting participants provided an example that using Twitter release did not increase many readers, such activity may continue in the future to gradually increase the exposure of the ESR products.

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

The ESR team has done more than just ABC objectives. For example, they presented their findings to the NPFMC, ecosystem-related meetings, and meetings on protected species and seabirds. These meeting participations and presentations all help fisheries management decisions.

The presentations to each group may be crafted to meet the need of the species discussed and the questions to be solved. The ESR may collect feedback from SSC and Council over time to better schedule conversations and optimize the processes. A small group meeting among the ESR, stock assessment species lead, a GPT representative, and the SSC species lead/representative may help.

The ESR team members may communicate with the Ecosystem Committee of the NPFMC by joining their meetings sometimes. Such interactions may facilitate future new information searching, new product, or effort allocation of the ESR team to meet the SSC and Council's needs better. ESR may communicate with SSC and Council on the information that may be helpful and hasn't been provided by the existing teams and committees.

The ESR may include a section on the ecosystem modelling progress in AFSC-related fisheries and ecosystems, the data used in these products, data gaps identified, and whether and how these products are used in ecosystem-based fisheries management.

Multiple teams are working on ecosystem or climate changes and their influence on marine organisms (e.g., Figure 2). Some overlaps in their tasks and objectives are reasonable, but clarifying their functions, tasks, and short-term and long-term objectives is also important. The ESR, EPS, Ecosystem Committee of NPFMC, EBS FEP, Climate Change Task Force, and climate-informed ecosystem modelling team may communicate annually to clarify functions and tasks and exchange information and findings. Such actions should clarify expectations from Council to ESR and other teams on ecosystem studies. Such functional clarification and overlap may be posted on their websites through flowcharts so that interested parties can go to the corresponding websites and contacts when needed and understand the product differences from each committee and working group.

The ESR may provide information on how the ecosystem changes negatively impact some species and how the changes benefit some other species, so both kinds of trends can be considered for fisheries management decisions. Those may be considered in the trade-off analysis discussed in TORs 1 and 2.

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

The current workflow of the ESR team lead is very intensive each year. It is time-consuming to coordinate with contributors and edit the reports. The ESR team has to balance the cost and benefit to meet different objectives, such as between the

broader benefit to non-ABC related functions and objectives and the targeted objectives of the ABC determination process.

The review panel recommended data automation as a short-term priority while supporting the information for ABC development, such as the Risk Table. The data automation includes data upload, recall, processing, and report generation. New plots, synthesis approaches, and analysis may be considered for long-term priority. The new information, new product, new outreach path, and tools should be considered as both short- and long-term priorities.

The review panel recommended adding back the diet or food web analysis, the historical catch and effort data, and the climate projections, if available, as short-time priorities. The ESR may include a section to quantitatively or qualitatively review ESR products used in ecosystem-based fisheries management. The ESR may also summarize how the assessment models have changed over time, especially in how they were developed in considering ecosystem changes. Such reviews help illustrate achievements and needs for new products.

The review panel realized that extra staff support on data automation and data repository might be needed. After the data automation step, the ESR leads can have more time to handle new and additional products. The review panel recommended broader ecosystem goals rather than ABC development focused. Such recommendations, if applied, may require extra staff and funding support in the future.

4. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The CIE review panel recommended ESR goals be broadened over time and recommended short-term and long-term priorities. My conclusions and recommendations are consistent with those from the CIE Panel. There is no apparent disagreement between the CIE panel and me on comments and recommendations. I here reorganize my conclusions and recommendations based on the TORs.

The current ESR goals to inform the development of ABC and OFL are still appropriate. To better meet the ABC-related goals, it is important to maintain consistency in the historical indicators considered and to be open to new data and information contributions. It is also reasonable to highlight emerging critical or new phenomena with a broad LME impact. To keep the length and readability of the annual report, some of the material that does not help address ABC changes or stock assessment models under the current ecosystem status can be saved as web-hosted appendices. The presentations to each group may be crafted to meet the need of the species discussed and the questions to be solved. The ESR may collect feedback from SSC and Council over time to better schedule conversations and optimize the processes. A small group meeting among the ESR, stock assessment species lead, a GPT representative, and the SSC species

lead/representative may help identify the critical information needed and the message conveyed to SSC at the right time.

The ESR goals should be broadened over time with considerations of ecosystem modelling development, education, and outreach. The balance of material consistency and new data and contributions is also quite important to meet these goals in the long run. Encouraging the contributors to be committed and engaged is important, which should guarantee reports are done on time and help data automation. Automating the data and contributors' input is important, which may be done through a team effort across the three ESRs, or securing extra staff support. Such effort may be high in the first couple of years. It will save lots more effort for the ESR team to change focus to other priorities and tasks, such as adding back the diet, food web analysis, spatial-temporal catch-effort data, collaborations with ESP and climate modelling teams, review progresses in ecosystem considerations in fisheries management, and communications with NPFMC and SSC. The figures and tables included in the ESR were now from contributors but may be linked to a data hub or repository in the future. Efforts on data sharing and repository should largely benefit the broader application of ESR and the Ecosystem-based model development and fisheries management.

The Briefs, Report Cards, Noteworthy topics, and Risk Tables are very informative and function as outreach material well at the same time. Further links to video talks to SSC and council, or PPT slides, should facilitate better outreach opportunities to the public with alternative interests and educational backgrounds. There are sometimes mismatches between what the contributors want (maybe local ecosystem questions, local fisheries, or pertinent questions) and the ESR's goals. It is important to explain how their contributions are being used in the short run and long run. It should be helpful if the ESR can bridge the contributors to other teams or agencies to better answer or solve their pertinent concerns.

Extra staff support seems needed to broaden the goals and functions of ESRs so that the team has a more automatic data input system and can handle data synthesis and extra analysis in the future, which should strengthen the existing goals of ESRs at the same time.

5. Comments on the NMFS review process

I find the CIE review process effective, clear, and meaningful. This specific review done for AFSC ESR was well organized both in the conduct of the meeting and in the presentations of the ESRs and related teams. The AFSC ESR team has been very patient and cooperative in dealing with questions on the ESR, other ecosystem study groups, and the AFSC and NPFMC management-related processes. It would be better if the presentations could be provided before the meeting. I have no further recommendations about the review process.

6. Acknowledgements

I want to thank all the AFSC ESR Team members contributing to the meeting for their informative presentations on the background information of the ESRs and for their willingness to provide helpful responses to the review panel's questions. I also would like to thank the other presenters and meeting participants who helped interpret the related entities supporting climate change and ecosystem-based fisheries management in the Alaska and North Pacific region. I also would like to thank the Drs. Stephani Zador, Bridget Ferriss, Elizabeth Siddon, and Ivonne Ortiz, who coordinated the review process together. Special thanks also go to other members of the review panel, Drs. Marta Coll Montón and Matthew Cieri for their respectful and productive discussions on the ESRs and TORs.

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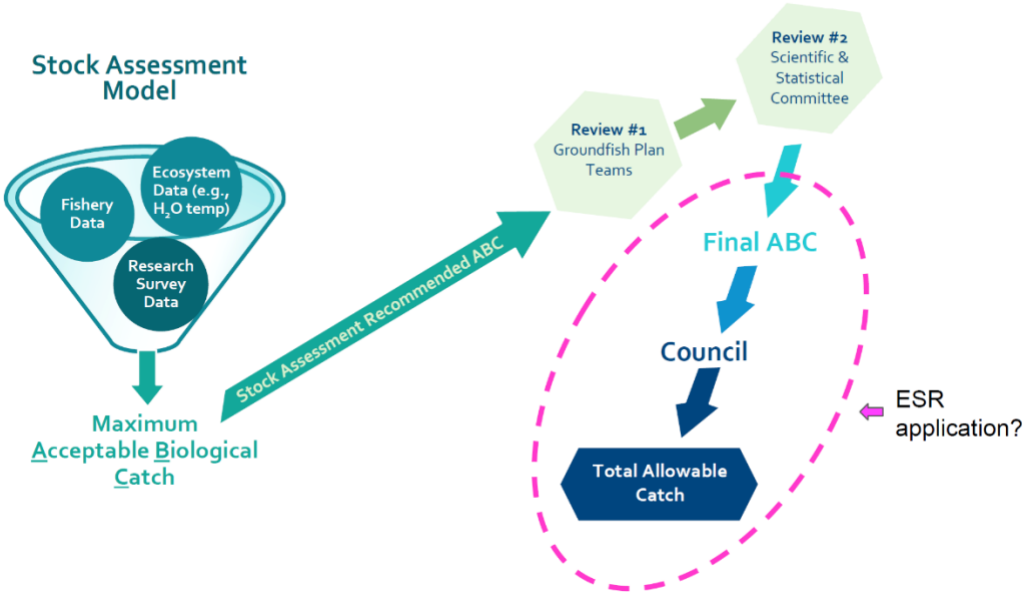

Figure 1: The annual catch limit-setting process for groundfish (Cited from Dr. Zador's presentation: How ESRs are used in fisheries management.)

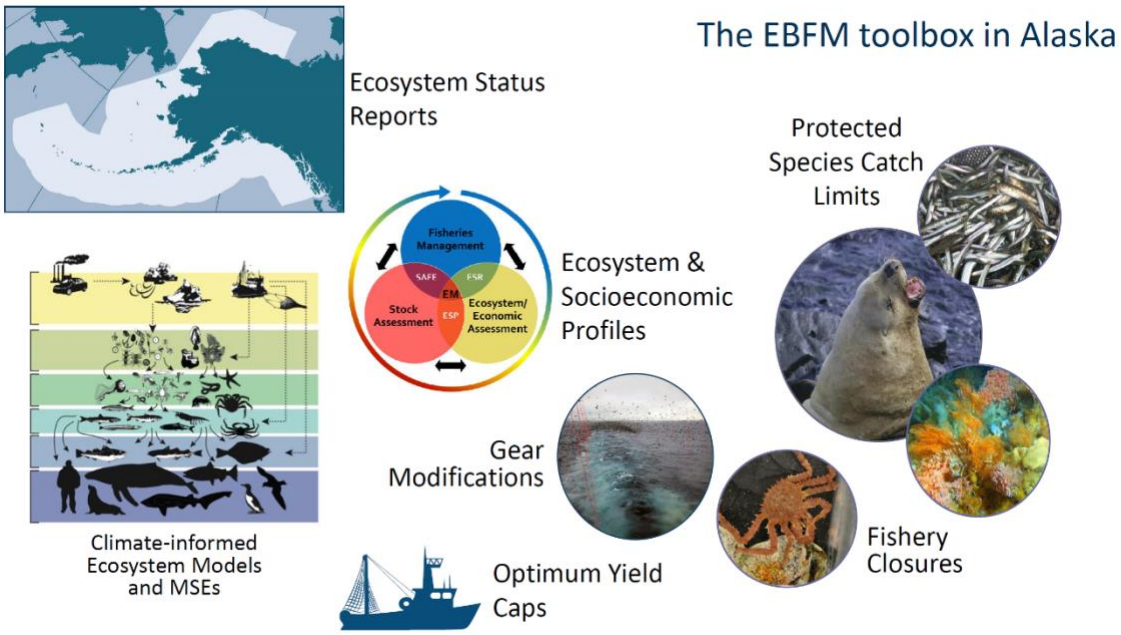

Figure 2: The EBFM toolbox in Alaska. (Cited from ESR team presentations: Terms of References).

Appendix 1: Bibliography of materials provided for review

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

Ortiz, I. and Zador, S. 2022. Ecosystem Status Report 2022: Aleutian Islands, Stock Assessment and Fishery Evaluation Report, North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501.

Ortiz, I. and Zador, S. 2022. 2022 Aleutian Islands Ecosystem Status Report: IN BRIEF. North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501.

Siddon, E. 2022. Ecosystem Status Report 2022: Eastern Bering Sea, Stock Assessment and Fishery Evaluation Report, North Pacific Fishery Management Council, 1007 West 3rd Ave., Suite 400, Anchorage, Alaska 99501.

Siddon, E. 2022. 2022 Eastern Bering Sea Ecosystem Status Report: IN BRIEF. North Pacific Fishery Management Council, 1007 West 3rd Ave., Suite 400, Anchorage, Alaska 99501.

Ferriss, B.E. and Zador, S. 2022. Ecosystem Status Report 2022: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report, North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501.

Ferriss, B.E. and Zador, S. 2022. 2022 Gulf of Alaska Ecosystem Status Report: IN BRIEF. North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501.

Background material provided for AFSC ESR for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska:

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

Martin W. Dorn & Stephani G. Zador (2020) A risk table to address concerns external to stock assessments when developing fisheries harvest recommendations, Ecosystem Health and Sustainability, 6:1, 1813634, DOI:10.1080/20964129.2020.1813634

Additional materials provided during the review:

Barbeaux, S.J., Holsman, K. and Zador, S. 2020. Marine Heatwave Stress Test of Ecosystem-Based Fisheries Management in the Gulf of Alaska Pacific Cod Fishery. Front. Mar. Sci. 7:703. doi: 10.3389/fmars.2020.00703

DiCosimo, J., Methot, R.D., and Ormseth, O.A. 2010. Use of annual catch limits to avoid stock depletion in the Bering Sea and Aleutian Islands management area (Northeast Pacific). ICES Journal of Marine Science, 67: 1861 - 1865.

Zador, S.G., Holsman, K.K., Aydin, K.Y., and Gaichas, S.K. 2016. Ecosystem considerations in Alaska: the value of qualitative assessments. ICES Journal of Marine Science, 74: 421 - 430.

Appendix 2: Statement of Work

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[1].

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. 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

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

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:

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.

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 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.

1. 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

2. 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.
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 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,	Each reviewer participates and conducts an independent peer review during the

2022	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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7600 Sand Point Way NE
Building 4
Seattle, WA 98115
bridget.ferriss@noaa.gov

206-526-4349

Annex 1: 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

Annex 2: Terms of Reference for the Peer Review

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)

Annex 3: Tentative Agenda

The Center of Independent Experts (CIE) review of the Ecosystem Status Reports
Feb 28 – March 2, 2023
Alaska Fisheries Science Center
7600 Sand Point Way NE
Seattle, WA 98115

Agenda *All times Pacific*

Day 1 Feb 28
Join with Google Meet: meet.google.com/dkm-zcbg-ywu
Join by phone: (US) +1 628-400-6658 PIN: 266 102 077#
Building 4, room 2079

Day 1 Feb 28	**Subject Presentations: approximately 50% presentation, 50% discussion per time block**	**Lead**
9:00	Introduction/logistics	Stephani Zador + all
9:15	History of ESRs	Stephani Zador
9:30	ESR Process (timeline, onramps, presentations, schedule)	Stephani Zador
9:50	ESR content (where information comes from, what's similar among the ESRs)	Elizabeth Siddon
10:10	EBS ESR unique attributes and how that might impact management	Elizabeth Siddon
10:30	break	
10:50	AI ESR unique attributes	Ivonne Ortiz
11:10	GOA ESR unique attributes	Bridget Ferriss
11:30	Data contributors: challenges, data management, timelines, examples	Ivonne Ortiz
12:00	Lunch - box lunch at cafeteria	
13:30	ESRs in other regions: NEFSC	Sarah Gaichas
13:50	ESRs in other regions: NW/SWFSC	Chris Harvey
14:10	break	
14:30	Council uses and needs: SSC perspective	Franz Mueter/ UAF, NPFMC SSC
14:50	Council uses and needs: Council perspective	Diana Evans/NPFMC
15:10	Risk tables and SA author interactions, what's changed since Dorn & Zador 2020	Stephani Zador
15:40	Ecosystem and Socio-economic Profiles	Kalei Shotwell
16:10	Non-Council uses of ESRs: Academia, public, communities, examples and pros/cons of expanding, including trade-offs	Bridget Ferriss
16:30	ESR communication and outreach	Elizabeth Siddon/Maggie Mooney-Seus
16:50	Public comment (virtual and in-person)	

17:00	adjourn	

Day 2 Mar 1
Join with Google Meet: meet.google.com/nfv-yfqs-wdr
Join by phone: (US) +1 334-697-3282 PIN: 632 526 014#
Building 4, room 2079

Day 2 Mar 1	**Terms of Reference: short presentations with questions and discussion time**	**Lead**
9:00	1. Should the ESR continue to tailor efforts to inform the ABC and OFLs?	Stephani Zador
10:00	2. How can the function of the ESR team better meet the Council's needs?	Elizabeth Siddon
11:00	3. How can the ESRs better meet the needs of the contributing scientists and other knowledge holders?	Bridget Ferriss
12:00	Lunch - box lunch at cafeteria	
13:00	4. How can the way the ecosystem science is selected, incorporated, and synthesized in the ESRs be improved?	Ivonne Ortiz
14:00	5. How can the process of disseminating the information in the ESRs be improved?	Bridget Ferriss
15:00	6. How can the ESRs maximize uptake into fisheries management decisions?	Elizabeth Siddon
16:00	7. What are the costs, benefits, and prioritization of new and/or additional ESR-related products?	Ivonne Ortiz
16:50	Public comment (virtual and in-person)	
17:00	adjourn	

Day 3 Mar 2	**Reviewer writing session only**
9:00	Reviewer writing period
12:00	lunch
14:00	Reviewer writing period
17:00	Adjourn

Contact: Stephani Zador, stephani.zador@noaa.gov, 206-526-4693

Version 24 Feb 2023

Appendix 3: Panel membership or other pertinent information from the peer review meeting

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

Abbreviations:

AFSC - Alaska Fisheries Science Center (NMFS/NOAA)
CIE - Center for Independent Experts
NEFSC – Northeast Fisheries Science Center (NEFSC/NOAA)
NOAA - National Oceanic and Atmospheric Administration
NWFSC - Northwest Fisheries Science Center (NEFSC/NOAA)