Evaluation of the Pacific Fishery Management Council Stock Assessment Review Process

REVISED FINAL REPORT

Lynker
An Employee-Owned Company

Pacific Fishery Management Council

Evaluation of the Pacific Fishery Management Council Stock Assessment Review Process

REVISED FINAL REPORT

Prepared by Thomas Remington, Stacey Kilarski, Dr. Christopher Hawkins, Dr. Emmanis Dorval, Dr. James Berkson

Edited by Melanie Jordan

Prepared for the Pacific Fishery Management Council
Under Contract #PFMC-Lynker-2025
Lynker Corporation

May 12, 2026

Executive Summary

The Pacific Fishery Management Council's (Council) Stock Assessment Review (STAR) process is regarded as a rigorous, transparent, and scientifically credible framework for reviewing stock assessments and supporting management decisions under the Magnuson- Stevens Fishery Conservation and Management Act. This evaluation examines how the process functions in practice, focusing on communication, engagement, efficiency, and capacity. The evaluation finds the STAR process provides high-quality scientific review and ensures assessments meet Best Scientific Information Available standards. However, the process faces increased strain from larger workloads, limited capacity, compressed timelines, and heightened stakeholder scrutiny.

Gleaning process participant perspectives, several themes emerged. Participants emphasized the importance of early and continuous engagement to identify concerns, local knowledge, and expectations well before formal review. Early engagement was highlighted as an effective way to reduce surprise, contention, and frustration later in the assessment cycle.

The evaluation also finds the need for clearer communication of scientific concepts such as uncertainty and risk. While uncertainty is rigorously treated within assessments, it is not always well understood by non-technical audiences or clearly connected to management. Participants urged that improved, plain-language explanations of when and where uncertainty buffers are applied would generally improve confidence in the Council's process.

Process fatigue driven by redundant review steps and overlapping deadlines is a growing concern. Although STAR Panels, the Council's Scientific and Statistical Committee, and management bodies each serve distinct and necessary roles, previously resolved issues can be revisited in subsequent forums under tight timelines. This can blur the boundary between scientific review and policy deliberation while increasing workload and confusion.

Participants underscored that assessment cadence matters not only for analytical efficiency but also trust. Long intervals between benchmark assessments can lead to large, unexpected changes in stock status and catch advice that are difficult for stakeholders to contextualize. Simultaneously, the tight timelines within which benchmark assessments must be produced and reviewed can be prohibitive both scientifically and for adequate stakeholder engagement.

Despite recent improvements (e.g., enhanced documents availability and virtual access), accessibility remains uneven, particularly for those unfamiliar with the Council. Participants expressed transparency alone does not ensure meaningful engagement, and clearer process narratives and guidance on how and when public input can influence outcomes are needed.

Across themes, the evaluation highlights structural capacity constraints as a challenge. Limited staffing, constrained travel budgets, and the high cost of rigorous peer review restrict the number of assessments that can be conducted and reviewed, even as expectations for engagement and transparency continue to grow. Participants consistently emphasized that sustaining the quality and credibility of the STAR process will require deliberate prioritization, realistic timelines, and continued investment in both people and process.

Memorandum – Generative Artificial Intelligence (AI) Usage Disclosure and Report Rectification

To: Pacific Fishery Management Council (PFMC), its Scientific and Statistical Committee (SSC), and its Advisory Bodies

From: Thomas Remington and Stacey Kilarski, Lynker Corporation

Date: May 12, 2026

Subject: Transparency Regarding Usage of AI Tools in Report Development

Purpose

The purpose of this memo is to provide a transparent accounting of how Lynker Corporation (Lynker) utilized generative Artificial Intelligence (AI) Large Language Model (LLM) tools during the development of the final report deliverable in its evaluation of the PFMC's stock assessment review process. Our execution of the project focused on scientific rigor and rebuilding stakeholder trust, however, there were several hallucinated citations present in the References section of the original submission that do not correspond to verifiable publications. Specifically, the memo also addresses the technical nature of these inaccuracies, details corrective actions taken to ensure the report meets Council standards going forward, and provides Lynker's perspective for why the Council and its Advisory Bodies, including the SSC, should elect to meaningfully consider the outcomes and recommendations stemming from the evaluation.

Summary of AI Applications and Source of Inaccuracies

To ensure standards of accuracy and transparency, we describe instances where we applied generative AI tools during the project's lifecycle. Generally, Lynker used AI as a productivity aid for four specific tasks:

1. Focus Group and Interview Transcripts - An embedded feature in Google Meet, Google Gemini 3 Pro (Gemini) was utilized to transcribe focus group and interview discussions between the project team and participants with the permission of all interviewees and focus group members. All Gemini-produced transcripts were reviewed by project team members and compared to notes otherwise captured during the sessions. While the voice-to-text transcriptions sometimes misidentified certain words and acronyms, the project team verified that the transcriptions generally characterized the discussions and input from participants and interviewees according to their understanding.
2. Bibliography Generation - OpenAI's GPT-5.2 (ChatGPT) was used to compile initial reference lists based on publications and references provided by the project's oversight team and external references collated by the project team. Despite an internal quality assurance/quality control process, false citations persisted in the final deliverable due to a combination of version control issues, contributions by multiple document authors, and inadequate verification by the project team.
3. Initial Focus Group and Interview Emergent Themes - ChatGPT was used to take an initial pass of high-level takeaways from raw transcripts. The project team manually reviewed these takeaways as a first step to our analysis and synthesis of the large volume of collected qualitative information.

4. Focus Group and Interview Quote Identification - After developing initial sets of recommendations based on the collective evaluation and synthesis of aggregated data, ChatGPT was used to identify additional specific phrases in our meeting notes and focus group transcripts related to subthemes. Several identified quotes were found to be summaries of collective participant feedback and meeting observations as opposed to verbatim statements, though the underlying implications that we intend to emphasize through these interpreted paraphrases remain intact.
5. Outline of Templates Provided in Appendices - As a value add for the Council, we used Gemini to suggest preliminary components of what could be included in the proposed BSIA Briefing documents (Appendix B), Advisory Body Bootcamp curriculum (Appendix C), and data use memo documents (Appendix D). These suggestions were considered and refined by the project team to result in the provided documentation, utilizing some suggestions, discarding others, and prioritizing our own perspectives to present the draft templates.

Though AI tools were employed to create efficiencies in our analysis, we maintain confidence in the technical substance and utility of the outcomes and recommendations for the Council. The recommendations are able to be explicitly tied to analysis of the conducted focus groups and interviews, case studies from other regions, and reference material. See Appendix E for a crosswalk of our recommendations against participant input, relevant references, observed meetings, quotations, and approaches leveraged by other councils.

Correction of Hallucinations and Report Revision

Upon notification of false citations, Lynker immediately conducted a complete manual verification of all content and citations included in our report. Through Council feedback and our internal audit, Lynker identified five citations in the References section of the original final report that were inaccurate or entirely non-existent (i.e., “hallucinated”). We believe these hallucinations are the result of inadequate version control and lack of subsequent verification during report development. Four of the hallucinated citations are not referenced in the report, and one was cited in a non-substantive manner based on automated output that was not manually scrubbed. This error is likely associated with the lack of verification amid collaborative narrative development by several authors at varying times and levels of investment using the erroneous bibliography thought to be accurate. All inaccurate references have been removed or replaced with verified sources.

Further, we conducted a holistic review of the deliverable, our characterization of the Council’s current processes to ensure accuracy and completeness, and the report’s content, including our recommendations, to ensure continued relevancy, applicability, and value to the Council. In doing so, we found that several report excerpts presented as quotations were not word-for-word depictions of participant statements, but at times had slight differences in terminology or structure, likely representing an amalgamation of collected perspectives. All referenced quotes have been verified, made clear that they are a paraphrased synthesis of multiple participants’ input, replaced with verbatim quotes, or removed entirely if they did not add substance to the analysis.

A comprehensive mapping of focus group discussions, interviewee input, verified references, case studies from other regions, observed meetings of the Council family, and professional perspectives to specific recommendations is provided in Appendix E. To ensure transparent specificity regarding changes to our deliverable, including removed and revisited content, an inventory of the unverified references that have been removed are provided in Appendix F alongside other report revisions stemming from additional review.

Potential for AI Influence in Synthesis and Development of Conclusions

AI-assisted synthesis of qualitative inputs, such as the preliminary material in our evaluation, can inadvertently compress nuanced and varied participant perspectives into an overly generalized consensus. Despite being proficient at identifying patterns, generative AI tools lack the empirical and contextual understanding to emphasize subtleties of participant perspectives. Accordingly, credibility of this report rests on the deliberate integration of human judgement and expertise, and direct engagement with source materials and focus group participants.

In light of the issues identified above, Lynker recognizes that transparency regarding the use of AI tools in our report is essential to rebuilding confidence. The use of AI was limited and conducted in a targeted manner to support our organization and efficiency, especially given the project timeline. With respect to influencing report content, the most likely area is in the use of AI tools to identify high-level takeaways from each Focus Group and Interview. We did not implement these initial AI-generated summaries as the ultimate basis for our interpretation, synthesis, or development of conclusions and recommendations, instead finding concurrence with several outputs and eliminating several others. We maintain that these outputs were reviewed and revised according to interpretations by the project team before meaningful incorporation into our synthesis and recommendation process. Each subsequent step of recommendation development was vetted, originating from members of the project team.

Rationale for Credibility Going Forward

We acknowledge that the presence of these AI hallucinations detracted from the ability of the SSC and Council to deliberate on this and other matters at meetings held in March and April of 2026. We also recognize that the inclusion of unverified references, ironically and unintentionally, undermines confidence in a report intended to help the Council rebuild trust among its stakeholders. To this end, we provide a revised final report to present clear traceability of our recommendations, ensuring that each is directly tied to participant perspectives and remains meaningful. By applying the report's own frameworks (e.g., Procedural Justice) and suggestions (e.g., under Theme 1, Transparency, and Theme 5, Feedback), we provide this revision and supplementary documentation showcasing our audit as a first step in rectifying the situation and advancing what we believe are still valuable process improvements for the Council.

We believe the fundamental value of the report is maintained because the primary inputs are grounded through participant views. The foundation of our evaluation through the lens of applied social science (i.e., Procedural Justice and the Theory of Change) also remains intact. The project team engaged directly with nearly 40 participants of the Council process to glean

and organize perspectives, and the inception of all of our recommendations can be directly linked to information provided by focus group participants and interviewees.

Through the actions described in this memo, we have implemented a holistic approach to rectification. We are ready to receive direct questions and candid feedback, and we invite the SSC to challenge assumptions, methods, and conclusions, where appropriate. Moving forward, we are committed to maintaining the integrity and utility of the underlying sources and outcomes, while using this experience to rebuild trust and thoughtfully inform how report findings may support the reconsideration of the Council's internal practices.

Table of Contents

Introduction and Project Overview

The Pacific Fishery Management Council (PFMC, or Council) contracted Lynker Corporation (Lynker) to undertake a comprehensive evaluation of its regional stock assessment review process, with particular focus on groundfish. While the existing process had operated effectively for many years, recent concerns, including shifting perceptions of the assessment framework and increasing federal budget constraints, highlighted the need for a structured review. Regular evaluation of the process is also good practice, helping ensure continued efficiency, transparency, and scientific rigor in Council decision-making.

The Lynker team's evaluation analyzed the existing review framework and identified opportunities for improvement that align with established best practices for public processes. We reviewed foundational documents, gathered perspectives from key participants, and conducted an independent analysis of potential challenges and solutions. This final report summarizes process participant perceptions, highlights areas for refinement, and offers actionable recommendations to strengthen the PFMC stock assessment review process.

A vital component of the project was direct engagement with stakeholders, including Council members, Council staff, stock assessment scientists, and advisory panel members representing industry and community interests. Lynker developed structured interview guides and conducted both in-person engagement and virtual interviews to capture diverse perspectives on the process. This stakeholder-driven approach ensured that recommendations reflected the needs and concerns of those directly affected by groundfish assessment and management. By integrating principles of effective public process, such as trust-building, shared understanding, scientific integrity, and efficient resource allocation, alongside insights from relevant literature and case studies from other fishery management councils, our team's review supports a more inclusive, adaptive, and resilient stock assessment review process. Ultimately, our findings and recommendations provide a foundation for the Council's future deliberations, with a goal of maintaining scientific integrity while adapting to evolving financial and institutional constraints.

More specifically, our evaluation found a system that is widely regarded for its scientific rigor in alignment with provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) but constrained by communication gaps, resource availability, and accessibility limitations. One participant noted that "*The Council staff and members do a wonderful job ensuring that this [stock assessment review process] is fully transparent*." Simultaneously, focus groups revealed that *the challenge isn't the science; it's keeping the science, the process, and the people aligned.* Five overarching major themes, comprising 17 subthemes, emerged from focus group sessions, one-on-one interviews, reviews of available reference material and guiding documents, and perspectives underpinned by the applied experience of Lynker's project team. We present these themes and concise versions of recommendations in Tables 1 through 5, expanding upon them thereafter. Collectively, these themes emphasize the need for greater clarity, more transparent pathways for stakeholder engagement, sustainable staffing and training mechanisms, and implementation of robust feedback loops for continued refinement.

In many cases, the identified themes are interconnected and directly relate to what we heard and why it matters. Throughout, we grounded our findings through social science and evaluative constructs and lenses.[1] The Lynker team's primary organizing framework is that of Procedural Justice, the study of perceptions of fair, consistent, and inclusive decision-making. Procedural Justice is underpinned by the examination of six rules:

1. Representation (e.g., are all affected groups represented in the stock assessment review process?);
2. Accuracy (e.g., is the information used in the development and review of stock assessments perceived as accurate?);
3. Correctability (e.g., can decisions be modified or reversed during the stock assessment review process?);
4. Consistency (e.g., is the stock assessment review process viewed as consistent across persons and through time?);
5. Bias suppression (e.g., are the personal self-interests or narrow perceptions of scientists, managers, and other participants suppressed?); and
6. Ethicality (e.g., is the stock assessment review process consistent with stakeholders' moral and ethical values?).

Our team also relied on the Theory of Change (ToC) framework, which provides a structured approach to understand how specific activities are expected to lead to desired outcomes, making explicit the causal pathways, assumptions, and contextual factors that shape program effectiveness. In the context of evaluating the Council's stock assessment review and adoption process, a ToC framework helps clarify how scientific assessments, stakeholder input, and Council deliberations translate into sustainable fisheries management decisions. By articulating the sequence of inputs, actions, outputs, and outcomes, the ToC identifies critical points where the process generates intended ecological, social, and economic benefits, or where gaps, bottlenecks, or unintended consequences may emerge.

Using a ToC approach in this evaluation allowed us to systematically examine both the formal procedures and the informal mechanisms that influence decision-making, including the integration of scientific uncertainty, stakeholder engagement, and feedback loops between management measures and fishery outcomes. It provided a lens to assess whether the stock assessment review process is functioning as intended and whether it contributes to long-term goals such as sustainable fishing, resilient ecosystems, and equitable access for stakeholders. Moreover, it highlighted the assumptions underlying management strategies, such as the adequacy of data, the responsiveness of the Council to new information, and the role of social learning in adaptive management, enabling our team to provide evidence-based recommendations for strengthening transparency, efficiency, and trust in the PFMC process.

Finally, we provide concise recommended actions that aim to enhance trust, efficiency, fairness, and objectivity in PFMC's stock assessment review framework.

[1] For example, the Rainbow Framework and Theory of Change principles.

Table 1. Summary of the **Transparency** theme and related subthemes with concise descriptions of recommended actions. See "Theme 1" for additional recommendation detail and rationale.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
1a. Clarity in Process Navigation	Assessment materials and considerations such as Terms of Reference (TOR) documents, data inputs and assumptions, and adoption processes are perceived as opaque and/or rigid. The public is unsure when and how input influences outcomes.	Visibility and predictability of the process are prerequisites for participation and trust.	1a-i. Create plain-language visual maps of the full assessment cycle.
			1a-ii. Continue and improve clarity of one-page assessment summaries.
			1a-iii. Simplify TOR introductions and clarify when and how they are developed.
			1a-iv. Publish "How to Engage" guide, specifying when and how stakeholders and the public will be engaged.
			1 a-v. Develop and maintain audience-specific communication tools that explicitly support the non-fishing community.
1b. Information Accessibility	Assessment documents are scattered across sites, and updates are difficult to locate.	Transparency depends on accessibility and ease of use.	1b-i. Centralize records on a single online portal.
			1b-ii. Standardize metadata and file naming conventions.
			1b-iii. Maintain current contact lists with quarterly updates.
			1b-iv. Provide documents embedded within the Council's summary of agenda items.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
1c. Meeting Accessibility	Virtual meetings improve access for participants and stakeholders where otherwise prohibitive (i.e., due to travel or timing) but dilute personal connection, making collaboration feel transactional.	When meetings emphasize efficiency over deliberation, nuanced exchanges and trust-building suffer. Balancing efficiency with authentic engagement is crucial to maintaining process legitimacy and inclusiveness.	1c-i. Continue employing hybrid meeting formats that combine remote accessibility with in-person interaction.
			1c-ii. Develop virtual facilitation protocols and rules.
			1c-iii. Train chairs and moderators in online deliberation/ facilitation techniques.
			1c-iv. Improve and standardize technical capacity for virtual meetings to minimize issues and interruptions during discussion.

Table 2. Summary of the **Communication** theme and related subthemes with concise descriptions of recommended actions. See "Theme 2" for additional recommendation detail and rationale.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
2a. Scientific Communication (e.g., Uncertainty, Risk, P*)	Stakeholders are often unclear on more technical aspects of stock assessments, e.g., how scientific uncertainty is expressed and how risk is quantified. Scientific terms like "data-limited," "P*," and "confidence interval" are not consistently explained.	Unclear processes and terminology lead to mistrust and "surprise" outcomes when assessments constrain fishery operations.	2a-i. Standardize the expression of uncertainty, brief risk summaries, and intuitive definitions of misunderstood terms, etc.
			2a-ii. Include brief, intuitive definitions of technical terms in public reports.
			2a-iii. Adopt plain-language pre-briefings deliberations relevant to assessment outputs.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
			2a-iv. Provide optional communication training modules for new participants.
2b. Intra-Council Communication and BSIA Determinations	Communication among the SSC, Council members, advisory bodies, and NMFS analysts can be inconsistent, especially during certification of the best scientific information available (BSIA) and policy adoption stages. Some Council members feel compelled to revisit scientific issues, and the SSC feels pressure to consider management trade-offs.	When information pathways are fragmented, decisions appear opaque, and duplication of effort erodes trust. Clear, consistent dialogue between the SSC (science authority), the Council (policy authority), and advisory bodies preserves each group's role while promoting mutual understanding.	2b-i. Include dedicated "BSIA Briefings" during Council meetings, using concise, plain-language (see Appendix B).
			2b-ii. Establish a technical referral protocol that allows the Council to request the SSC to reevaluate determinations when new information arises.
			2b-ii. Host cross-body workshops to align expectations and understanding.
2c. Advisory Body Orientation and Onboarding	New advisory body members face steep learning curves, and orientation can be inconsistent.	Effective orientation and onboarding are foundational to institutional memory, participation equity, and decision quality within the Council's advisory structure.	2c-i. Develop recurring "Advisory Body Bootcamp" programs (see Appendix C).
			2c-ii. Rotate advisory body alumni as informal mentors for new members.
			2c-iii. Encourage Council staff to host periodic "office hours."
			2c-iv. Develop a concise Advisory Body Handbook.

Table 3. Summary of the **Stakeholder Engagement** theme and related subthemes with concise descriptions of recommended actions. See "Theme 3" for additional recommendation detail and rationale.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
3a. Early Integration of Local and Cooperative Data and Perspectives	Local ecological knowledge (LEK) as well as cooperative data and fishermen's empirical perspectives about data veracity are typically incorporated too late to influence outputs (or not at all).	Early integration strengthens technical robustness, social legitimacy, and stakeholder buy-in, transforming participation from consultation to co-production of knowledge.	3a-i. Prioritize two-tiered, early data workshops preceding assessment cycles.
			3a-ii. Develop "data-use memos" showing how inputs were applied (see Appendix D).
			3a-iii. Offer training in interpreting and incorporating LEK.
			3a-iv. Encourage NMFS to cultivate cooperative data collection and/or research programs for groundfish fisheries.
3b. Pre-Assessment Engagement	Engagement opportunities before STAR Panel review processes are inconsistent and not always inclusive. Early engagement allows stakeholders to ask questions, clarify data assumptions, and understand model design.	When stakeholders are involved before stock assessment modeling occurs, misunderstandings surface early, data quality improves, and trust in the scientific process deepens.	3b-i. Continue (and increase) investment in pre-assessment workshops.
			3b-ii. Encourage engagement points for stakeholders with the STAT.
			3b-iii. Partner with the Marine Resource Education Program (MREP) or similar programs to adapt early learning modules for stakeholder audiences.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
3c. Assessment Education and Training	Informal monthly workshops (e.g., those administered by NWFSC's Jason Cope) and MREP-style training build understanding but are not obligatory or internal to assessment processes.	Continuous learning improves collaboration and reduces contention later in review cycles.	3c-i. Institutionalize education sessions (e.g., MREP).
			3c-ii. Standardize "Data Workshop Packets" summarizing data and decisions.
			3c-iii. Develop educational videos or briefing papers.

Table 4. Summary of the **Assessment Process Cadence** theme and related subthemes with concise descriptions of recommended actions. See "Theme 4" for additional recommendation detail and rationale.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
4a. Resource Constraints	Staffing shortages and turnover, flat budgets, and overlapping reviews strain capacity.	Resource bottlenecks and burnout threaten assessment frequency and review quality, especially with respect to incorporating feedback from wider stakeholder groups.	4a-i. Further integrate workload planning processes.
			4a-ii. Streamline review layers and reduce redundancy.
			4a-iii. Request multi-year/rotating funding structures.
			4a-iv. Expand scientist cross training.
4b. Process Fatigue	Fatigue stems from overlapping review layers, long meeting durations, and repeated cycles of similar discussions across assessment processes.	Process fatigue reduces the quality of participation, limits creativity, and weakens morale among scientists, reviewers, and stakeholders.	4b-i. Rebalance workload through a three-stage STAR process.
			4b-ii. Limit redundant review steps.
			4b-iii. Formally schedule rest periods.
			4b-iv. Rotate review participation.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
4c. Stock Assessment Prioritization	There are too many stocks to assess for available analysts, which expedite review timetables and prohibit external input and meaningful revision. The public is unclear on prioritization criteria for assessed stocks.	Transparent prioritization manages expectations and optimizes resource use. It also provides the potential to alleviate constraints associated with cycle timing.	4c-i. Publish annual prioritization lists with rationale.
			4c-ii. Use prioritization lists as justification for alternative approaches.
			4c-iii. Reinforce transparent scoring criteria.
			4c-iv. Link prioritization to workload planning.
4d. Assessment Categorization and Evolution of Approaches	Despite a spectrum of available assessment approaches, there has been a relative stagnancy. The labels “data-limited” and “data-moderate” can be perceived as implying weaker science and introduces confusion about what data are used. The spectrum of available methods includes viable tools that may influence assessment prioritization and timing of cycles.	Misunderstood terminology affects public perception of the Council’s scientific process and associated credibility, promoting skepticism. Use of alternative assessment approaches enables NMFS and PFMC to maintain timely, science-based management while allocating resources efficiently.	4d-i. Emphasize the continuum of stock assessments based on data availability.
			4d-ii. Explain data usage and rationale when reviewing assessments using these methods.
			4d-iii. Encourage STATs to continue employing these assessment approaches.
			4d-iv. Develop outreach materials on these methods.

Table 5. Summary of the **Feedback** theme and related subthemes with concise descriptions of recommended actions. See “Theme 5” for additional recommendation detail and rationale.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
5a. Transparency Feedback	Frustration exists that feedback, when it occurs, often is solicited after key decisions are finalized,	Feedback is essential to adaptive governance. Without	5a-i. Conduct earlier, iterative feedback check-ins (e.g., through the pre-assessment workshop

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
	leaving no opportunity for adaptive response. Process participants stop offering suggestions when they are not meaningfully considered or integrated, even if it is due to timing in the cycle.	clear feedback loops, participation becomes transactional rather than collaborative, weakening institutional trust and learning. Scientists lose opportunities to improve, and stakeholders disengage when they cannot trace how their input shaped outcomes. Robust, two-way feedback transforms participation into shared learning, institutionalizes reflection, and documents how the process evolves over time. It operationalizes accountability and procedural justice, ensuring that PFMC decisions are not only scientifically defensible, but socially legitimate.	and additional touch points).
			5a-ii. Proactively solicit feedback following each assessment cycle.
			5a-iii. Integrate feedback reviews to include evaluations of hybrid meeting formats.
			5a-iv. Public summarize feedback themes and resulting adjustments.
5b. Communication Feedback	The tone of feedback affects participation, as constructive feedback invites collaboration and reactive feedback prohibits dialogue. Feedback should be clear, timely, and constructive, focused on improving processes rather than assigning blame. Feedback to scientists from policy bodies sometimes lacks specificity.		5b-i. Develop feedback communication guidelines.
			5b-ii. Establish cross-body workshops to exchange feedback.
			5b-iii. Encourage leadership to model communication practices.
			5b-iv. Emphasize effective feedback examples.

Theme	Key Issue / What We Heard	Why It Matters	Brief Description of Recommended Actions
5c. Engagement Feedback	Public testimony and workshop contributions feel futile if they rarely receive acknowledgment or summaries explaining how their input informed model assumptions or Council deliberations. While not every suggestion must materialize in a tangible outcome, the Council should strive to ensure feedback is heard, logged, and meaningfully considered.		5c-i. Create a public engagement feedback tracker and the Council or SSC's corresponding response.
			5c-ii. Incorporate responses to public input in meeting minutes.
			5c-iii. Explicitly encourage participants to provide engagement feedback in a constructive and specific way.
			5c-iv. Include updates to the Council on how input shaped processes.
5d. Assessment Process Feedback	Systematic feedback would help train new analysts and maintain consistency when staff turnover occurs. Sentiments surrounding feedback are linked closely to process fatigue, as emotional exhaustion can materialize when the same issues reappear because lessons are not institutionalized.		5d-i. Develop an internal feedback archive or tracking spreadsheet, emphasizing outcomes from post-STAR retrospectives.
			5d-ii. Use findings to update TOR and training.

Methodology

The Lynker team's evaluation of the PFMC stock assessment review process employed a mixed-methods approach, combining structured document review, qualitative analysis, and stakeholder engagement to evaluate existing processes with a focus on groundfish stock assessments. We designed these methods to align with established PFMC assessment, review, and the BSIA frameworks under the MSA. We provide additional details regarding the various aspects of the Lynker team's effort below.

Document Review

Our team conducted a comprehensive review of peer-reviewed scientific literature, NOAA Technical Memoranda, PFMC policy and guidance documents, NOAA Fisheries Science Center program review materials, as well as documents that could serve as case studies from other regions. We collated these documents from the PFMC's Executive Director, Merrick Burden, from members of the Oversight Team, including the Directors of the NOAA Fisheries Northwest Fisheries Science Center (NWFSC) and Southwest Fisheries Science Center (SWFSC), from focus group participants (see below), and through independent research and case studies. These documents collectively describe the technical development of stock assessments and their guiding directives, the institutional processes governing their review and adoption, and the broader stock assessment review enterprise, including prioritization, capacity, and transparency.

We reviewed materials including the West Coast Regional BSIA Framework, Terms of Reference (TOR) for the groundfish stock assessment review process for 2025-2026, previous assessments and responses to Science Center assessment program reviews, national stock assessment improvement guidance, reports and presentations from external experts regarding recent groundfish stock assessments, as well as informal documents describing assessment planning processes and stock assessment histories. Our team also reviewed a wide range of primary publications describing the regional fishery management councils generally (Eagle et al., 2003), the role of scientific advisory committees in establishing harvest specifications (Crosson, 2013), data-limited and data-moderate assessments (Cope et al., 2015; Dick & MacCall, 2010; Wetzel & Punt, 2011), bias in stock assessment prioritization and review (Satterthwaite, 2023), increasing 'politicalization' of fishery science and management (Terceiro, 2018) and associated management delays (Shertzer & Prager, 2007), and considerations for the rejection of a new assessment as best available science (Punt et al., 2020).

The Lynker team analyzed these documents using qualitative content analysis to identify recurring methodological themes, assumptions, strengths, and limitations. Our ingestion especially focused on prescribed data inputs, model structures, treatment of uncertainty and fixed parameters, peer review practices, and decision points affecting assessment acceptance or rejection for management use. With respect to TOR and BSIA framework documents, we closely examined the roles and responsibilities of Stock Assessment Teams (STATs), Stock Assessment Review (STAR) panels, the Council's Scientific and Statistical Committee (SSC), other advisory bodies such as the Groundfish Advisory Subpanel (GAP) and Groundfish

Management Team (GMT), Council staff, and NOAA Fisheries scientists. We used program review documents from the NWFSC and SWFSC to evaluate how assessment capacity, prioritization, staffing, and review rigor influence assessment outcomes and management advice. Relevantly, we acknowledge that STAR processes and the PFMC's adoption of the STAR Panel-reviewed products to inform management decisions are not necessarily the same thing.

Stakeholder Interviews

The Lynker team used a semi-structured interview methodology to guide our engagement. We convened ten focus groups with nearly 40 stock assessment review process participants, ranging from scientists, managers, industry members, and other knowledgeable experts and stakeholders engaged in the groundfish assessment enterprise. We designed interview protocols to elicit perspectives on data availability, model assumptions and uncertainty, transparency, review dynamics and cadence, and perceived strengths and challenges of current assessment review and governance practices. We developed an effective interview guide for focus group sessions by carefully planning to ensure discussions would elicit rich, relevant insights. We began with a clear understanding of the information we sought to gather stemming from our review of relevant documents, which guided our formulation of focused, open-ended questions. Our team organized questions thematically and sequenced them logically, starting with general topics to build rapport before moving to more specific or sensitive issues. We used neutral, non-leading language to avoid biasing responses and included prompts or probes to encourage deeper reflection. We pilot tested the guide with a small internal group, which helped identify unclear wording or gaps and allowed us to refine it before the full focus group sessions.

The Lynker team's interview approach and guide emphasized understanding the perceptions that participants have of the stock assessment review process. Although such perceptions do not necessarily correspond to objective measures of reality, they are important to understand because they are often a lens through which scientists, managers, and stakeholders interpret, in this case, the effectiveness of the Council's management processes; this, in turn, has direct implications for establishing trust from process participants, eventually leading to buy-in. For example, we acknowledge that National Standard 2 of the MSA mandates the use of the "best scientific information available" for conservation and management measures (50 CFR 600.315(a)); however, we inquired with focus group participants about their *perceptions* of the accuracy of information incorporated into stock assessments. See Appendix A for the Lynker team's semi-structured interview guide employed in facilitating these focus groups.

We organized focus group input responses thematically, aligning perspectives with findings from our document review. Table 6 provides a list of focus groups (A through J) we convened, the date of the focus group, and number of participants.

Table 6. List of focus groups and Interviews for which the Lynker team applied its semi-structured interview guide.

Meeting	Participant(s)	Date Convened	Number of Participants
Focus Groups			
Focus Group A	PFMC Staff	June 9, 2025	4
Focus Group B	PFMC Members	June 18, 2025	4
Focus Group C	PFMC SSC Members	July 8, 2025	5
Focus Group D	GMT and GAP Members	July 23, 2025	4
Focus Group E	NOAA Fisheries NWFSC Staff	August 7, 2025	3
Focus Group F	NOAA Fisheries SWFSC Staff	August 15, 2025	5
Focus Group G	NOAA Fisheries WCR Staff	August 18, 2025	3
Focus Group H	Non-Governmental Organization Representatives	September 17, 2025	1
Focus Group I	Industry Representatives	September 12, 2025	3
Focus Group J	Other External Experts	September 16, 2025	4
Targeted Interviews			
Individual	Merrick Burden (PFMC Executive Director)	October 3, 2025	1
Individual	Dr. Jason Cope (NWFSC Staff)	September 25, 2025	1
Individual	Sarah Nayani (Industry Representative)	December 11, 2025	1

Meeting Attendance and Observation

Members of the Lynker team attended relevant meetings of the PFMC and its advisory bodies (e.g., the SSC), as available during the study period, to observe assessment-related discussions. Table 7 provides a list of PFMC meetings the Lynker team attended, either in-person or virtually. We reviewed meeting materials, deliberations, and public discussions to contextualize how scientific information is interpreted, deliberated, and advanced through the management process. We integrated observational notes with our preceding document analysis and focus group findings to better illustrate how formal procedures operate in practice.

Table 7. List of PFMC meetings the Lynker team attended, both in-person and virtually.

Meeting	Date(s)
In-Person Attendance	
Rougheye / Blackspotted Rockfish and Sablefish STAR Panel	July 14-18, 2025
SSC Groundfish Subcommittee Meeting / SSC Meeting / PFMC Meeting	September 18-20, 2025
SSC Meeting	November 13, 2025
Virtual Attendance	
Yellowtail Rockfish STAR Panel	May 19-23, 2025
Chilipepper Rockfish and Quillback Rockfish STAR Panel	June 23-27, 2025
SSC Groundfish Subcommittee	October 14-16, 2025

Synthesis and Recommendations

The Lynker team synthesized findings from document review, focus groups, and meeting observations to identify areas of convergence and divergence between formal assessment guidance, applied scientific practice, and stakeholder experience. We leveraged a triangulation approach to evaluate how scientific uncertainty, methodological choices, and institutional constraints shape assessment review outcomes and subsequent management decisions, and to assess consistency with BSIA principles of transparency, objectivity, peer review, and relevance. Stemming from this synthesis, we identified potential gaps in process application and opportunities to garner additional stakeholder trust, resulting in our proposed recommendations for the Council's consideration.[2]

[2] In synthesizing participant perspectives to form recommendations, we acknowledge a potential imbalance in recommendations addressing stakeholder needs. The Lynker team believes this disparity reflects project goals in that the PFMC explicitly identified external stakeholders as the participant group for which trust in the assessment review processes has eroded most in recent years. Simultaneously, we believe that the provided recommendations will be mutually beneficial for all participants in processes associated with West Coast stock assessment development, review, and adoption.

Theme 1 — Transparency

Major Theme 1 is transparency. Transparency in this context refers to the extent to which institutions, organizations, or decision-makers openly share information about their processes, actions, and rationales in ways that allow stakeholders to understand, evaluate, and hold them accountable. It emphasizes clarity, accessible communication, and the availability of relevant information that enables others to see how and why decisions are made. Social science researchers have long emphasized transparency as a foundational mechanism for building and maintaining stakeholder trust. Studies across public administration, organizational behavior, and environmental governance consistently show that when institutions clearly communicate their decisions, evidence, uncertainties, and constraints, stakeholders perceive them as more reliable and legitimate. Transparency reduces information asymmetry, a well-known driver of distrust, by giving stakeholders the ability to understand *how* decisions are made and *whose interests* are being considered. This openness allows stakeholders to assess the fairness, competence, and intentions of decision-makers, three core dimensions through which trust is evaluated in the social sciences.

Research also demonstrates that transparency is not only about providing information but about doing so in ways that are timely, accessible, and responsive. Effective transparency signals respect for stakeholders' perspectives and affirms their right to be informed participants in the process (Rowe and Frewer, 2000; Beierle and Konisky, 2000). In environmental and community-based contexts, scholars have shown that consistent and meaningful transparency fosters long-term trust by demonstrating accountability and reducing perceptions of arbitrariness or hidden agendas. Over time, this pattern of open communication creates a positive feedback loop wherein transparency enhances trust, which in turn improves cooperation, compliance, and shared problem-solving, further reinforcing the relationship between institutions and the communities they serve (Lind and Tyler, 1988).

Transparency is one of the "starting conditions" and "process drivers" that enable trust-building. In multistakeholder or community-based processes, long-term collaboration depends on credible commitments, shared understanding, and repeated interactions (Ansell and Gash, 2008; Emerson and Nabatchi, 2015). This is a core construct of Collaborative Governance Theory, which espouses the open sharing of data, process design, uncertainties, and decision rationales to help participants move to mutual trust and collective problem-solving.

Tyler, Lind, Thibaut and Walker and others have shown that people are more likely to trust institutions when they perceive the decision-making process as fair, consistent, and inclusive (e.g., Lind and Tyler, 1988).This line of inquiry is known as Procedural Justice, which refers to the perceived fairness of the *processes* used to make decisions, allocate resources, or resolve disputes. In social psychology and public administration, this construct emphasizes that people evaluate institutions not only by the outcomes they produce (i.e., Distributive Justice) but by how those outcomes are reached. Fair procedures are typically characterized by transparency, consistency, opportunities for voice or participation, impartiality, respect, and explanations of decisions.

Procedural Justice research has consistently found that when people believe decision-making processes are fair, they are more likely to trust authorities, accept decisions, even unfavorable ones, and remain engaged in cooperative relationships.

Transparency can be hampered if relevant information is difficult to access. Participants across focus groups generally described PFMC's assessment materials and documents as "*there, but scattered*." Multiple repositories across groups and organizations, inconsistent file naming, and limited search functionality reduce the ability for potential process participants to locate information, effectively excluding those less familiar with fisheries management approaches. When stakeholders or new entrants to the process must rely on personal contacts or individual guidance to access references or meeting summaries, the process becomes inherently less inclusive and more dependent on institutional knowledge. Consistent information management is essential to maintaining accessibility, accountability, and continuity, especially acknowledging difficulties associated with staff turnover and varying stakeholder involvement over time. Making assessment materials easier to locate ensures that transparency extends beyond compliance to usability, supporting more equitable participation and organizational learning.

Focus group discussions highlighted that non-fishing members of the public face distinct barriers to engaging in the stock assessment review process, even when documents are publicly available, due to technical complexity, dispersed information, and limited contextual framing. Participants emphasized that improving accessibility requires more than document availability, and depends on clear process narratives, audience-specific summaries, and explicit explanation of how and when public input can inform decisions.

1a: Clarity in Process Navigation

Participants emphasized that PFMC's assessment and review framework is technically rigorous yet difficult to follow for those outside the process. One focus group participant noted, *"it took me [several cycles/years] to gain a decent understanding of the assessment process, review, adoption, and TOR."* Stakeholders described uncertainty about when the stock assessment TORs are developed and how rigidly they apply, how model revisions are introduced, and where their input fits within the assessment development and review cycle. The current TOR for the Council's groundfish stock assessment review process for 2025-2026 state that the SSC is responsible for developing the TOR in coordination with NMFS, state agencies, Tribes, and Council advisory bodies, and that the SSC provides guidelines with accepted practices for data uses and modeling approaches for stock assessments (PFMC, 2024; p. 28). However, process participants would benefit from additional clarity on TOR development and application. A participant indicated that even experienced participants struggle to see the through-line from data workshop to SSC adoption, noting that "there isn't a single place… where the public can go to see the entire process."

We highlight perceived process opacity as a recurring barrier to consistent engagement and increased trust. Participants recommended developing plain-language flowcharts and concise timelines that clearly show data inputs, review points, and decision authority alongside

additional clarity regarding TOR. Participants viewed visual mapping as the most achievable reform to improve predictability and procedural fairness.

Focus group participants generally described the assessment process as technically sound but hard to trace. Without a clear map of decision points, stakeholders struggle to understand when and how input influences outcomes. This can erode confidence in the process, limit constructive engagement, and increase process fatigue when there are continued but unsuccessful attempts to understand and engage. Improving clarity is therefore an issue associated with both communication and fairness, grounded in the principles of procedural justice and institutional trust. Process predictability allows stakeholders to meaningfully engage at the right times, strengthens understanding of scientific capabilities and constraints, and enhances collective ownership of the assessment outcomes.

Recommended Actions:

1a-i. Create plain-language **visual maps** of the assessment cycle showing stages, responsible parties, where input can be received, and decision windows (e.g., see Figures 1a, 1b, 2).

   a. Distribute these visualizations at all public-facing meetings where the Council or its advisory bodies discuss assessment development or review as well as on the PFMC website.

1a-ii. Continue developing and refining **one-page assessment summaries** with clear explanations of methods and outputs that are digestible by broader stakeholder audiences; ensure robust distribution consistent with Recommendation 1a-i.

   a. Consider separate technical and plain-language summaries for varying audiences.

1a-iii. Simplify the **implementations of TOR** by clarifying development, update, and revision intervals (i.e., when and where) and procedures for overarching and assessment-specific TOR; this breakdown should also emphasize the extent to which TOR allow for flexibility in their application (e.g., anticipated variations in data availability, stock status, and assessment methodologies).

   a. Highlight flexibility provided by supplemental guidance documents that accompany TOR but do not replace them. For example, the Accepted Practices Guidelines for Groundfish Stock Assessments for 2025 and 2026 (SSC Groundfish Subcommittee Report 1, March 2025, Agenda Item H.4.a) provides default approaches for common modeling issues and notes that assessment scientists may diverge from the guidelines with justification prior the STAR panel or other review body meetings.

1a-iv. Publish a concise **"How to Engage" guide** for stakeholders explaining when and how feedback is most effective. These guides should specify when stakeholders and the public will be engaged (or can proactively engage), the process by which feedback will be ingested and integrated by NMFS and the Council, the type of feedback that can be meaningfully provided at each juncture for inclusion in the assessment cycle, as well as

other feedback guidelines.

1a-v. Develop and maintain audience-specific communication tools (e.g., plain-language process overviews, short summaries, and navigation aids) that explicitly **support the non-fishing community** in understanding and engaging with the assessment review process.

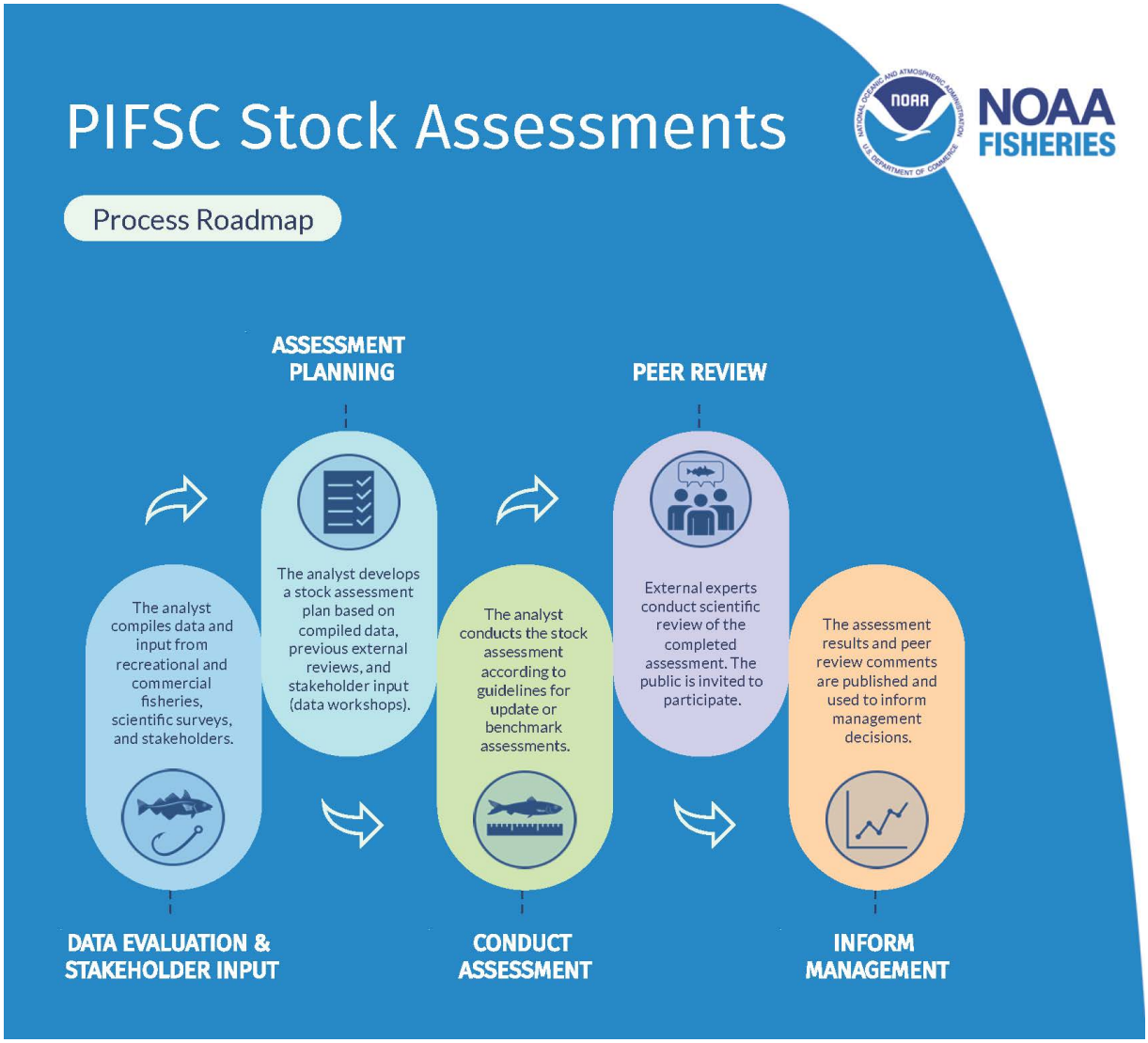

Figure 1a. Example visual map of assessment cycle from the Pacific Islands Region (sourced from the PIFSC Fisheries Research and Monitoring Division)

Figure 1b. Example visual map of assessment cycle improvement processes specific to American Samoa Bottomfish Management Unit Species preceding the 2023 benchmark stock assessment (Nadon et al. 2023; sourced from the PIFSC Fisheries Research and Monitoring Division)

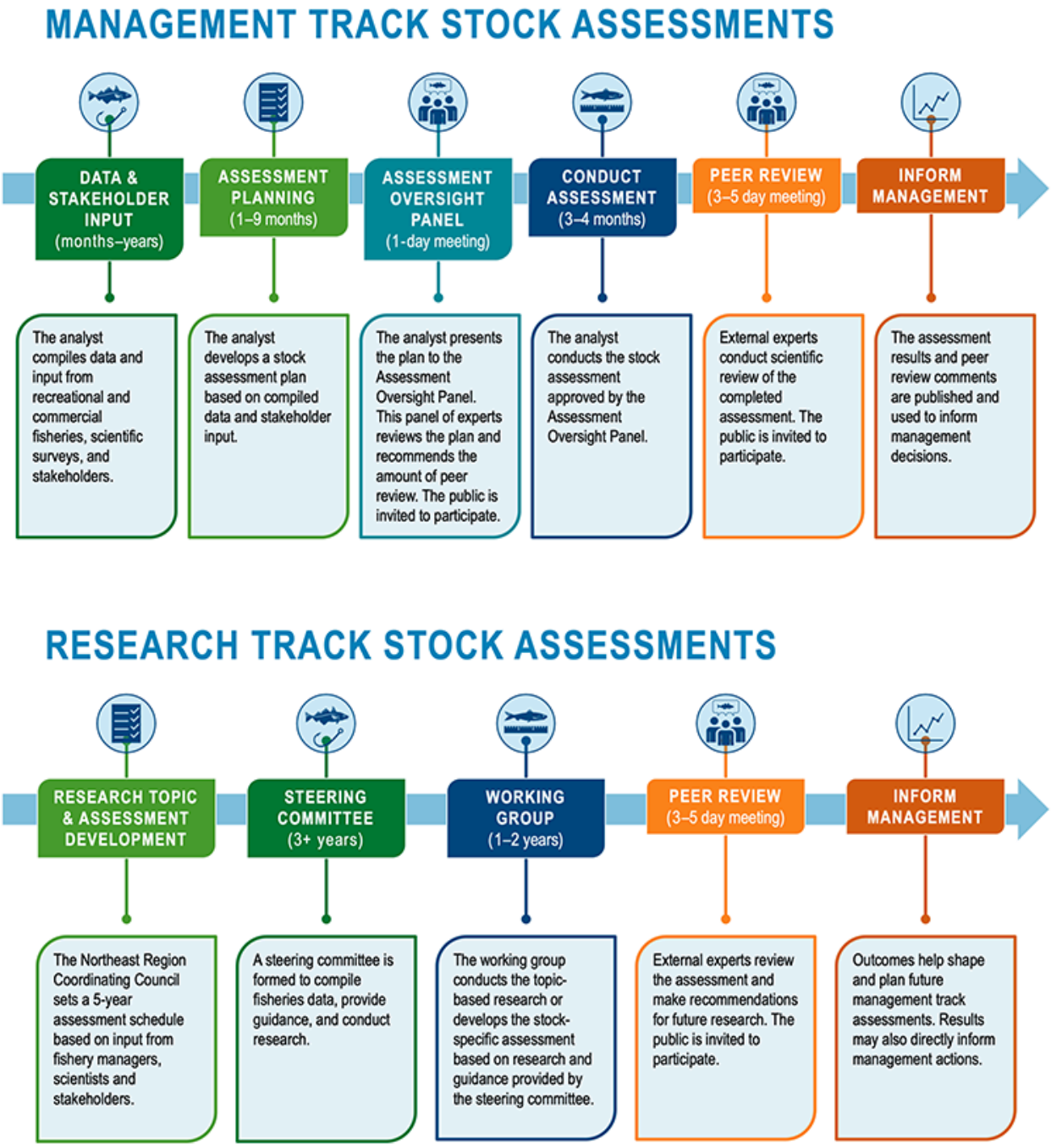

Figure 2. Example visual map of assessment cycle from the Mid-Atlantic Region (sourced from the Mid-Atlantic Fishery Management Council website)

1b: Information Accessibility

Participants described difficulty finding key documents or understanding where to locate past and present assessments and associated references.A focus group participant remarked, *"It's challenging to find information about the stock assessment review and adoption process."* and that "*data [are] sort of scattered everywhere.*" Meeting notes and outcomes often appear on multiple webpages, and reports and reference source documents are archived inconsistently across NMFS and PFMC portals. We identify document fragmentation as a barrier to more effective engagement. Consolidating digital access emerged as one of the most actionable improvements. Participants proposed a centralized "Stock Hub" site containing assessment histories, decision logs, and contact information of key individuals. Participants believed this approach would transform accessibility from an insider skill to a standard feature, improving transparency. Relatedly, standardizing metadata and file naming conventions would mitigate any issues associated with loss of context when files are shared outside of their original directory structures.

Relatedly, at a meeting of the Council's SSC held in Costa Mesa, CA, on November 14, 2025, members discussed issues with navigating the Council's briefing book to access requisite information and materials related to groundfish stock assessments. SSC Chair, Jason Schaffler, suggested that the PFMC's summary of agenda items includes a comprehensive list of all available documents. We support implementing this suggestion preceding the development of something like a "Stock Hub" given the straightforward nature of implementation. The idea of a "Stock Hub" draws on existing NOAA Fisheries models like the Species Information System (SIS) public portal and the Stock Assessment Support Information (SASINF) tool. Centralizing assessment materials into a "Stock Hub" addresses the goal of the project to enhance transparency and trust by reducing the 'siloed' nature of information that currently leads to stakeholder tension.

Recommended Actions:

1b-i. Requesting support from NMFS, centralize all relevant assessment materials, including Advisory Panel reports and review references, on a single **online "Stock Hub" portal** containing document histories, decision logs, and related correspondence. The Council may consider leveraging existing regional infrastructure and Application Programming Interface (API)-driven designs used by NOAA Fisheries and other councils.

   a. Organize the portal by assessment cycle in lieu of presenting a static list of PDFs, tracking a stock from the "Research/Data Collection" phase through "Final Rule."

   b. Host all relevant STAR reports, SSC and GMT reports, rebuilding analyses, and TOR in one location, effectively making the portal a centralized document repository. It should also maintain an archival history of models and data inputs so stakeholders can track how a benchmark assessment evolved into an update assessment over multiple years.

c. Consider implementing a decision tracking module that records major and minor technical choices (e.g., choice of priors or model structures) made during STAR panels.

d. Consider including a searchable “What’s New” feed (i.e., similar to a news feed) that highlights upcoming SSC agenda items, new draft reports available for public comment, ongoing assessments, and key recommendations from advisory panel statements (e.g., the GAP and GMT).

e. Consider creating a shared data environment with NWFSC and SWFSC so that scientific products (e.g., r4ss files) can be automatically pushed to the portal once verified.

f. Use consistent tagging for all files (e.g., species, year, review tier, document type; related to Recommendation 1b-ii below) to ensure a robust search function.

1b-ii. Standardize **metadata and file naming conventions** for consistent archival retrieval across past and contemporary documents and references. Ensure document names are intuitive and easily searchable.

a. Consider alignment with federal data management standards (e.g., following ISO 19115) and NOAA’s Data Management Handbook.

b. Consider utilizing the following naming convention:

i. Date (YYYYMMDD): Essential for sorting chronologically.

ii. Stock/Species Code: (e.g., “QBR” for quillback rockfish).

iii. Document Type: (e.g., “STAR-Panel,” “Report,” “DecisionLog”).

iv. Version: Prefaced by "v" (e.g., v01, v02) and status indicators like “_Draft” or “_Final.” Example: “20250615_QBR_STAR-Panel_Report_v02_Final.pdf”

1b-iii. Maintain **current contact lists** (e.g., Council, SSC, GAP, NMFS scientists) for assessment cycle participants, update quarterly, and make them available on the PFMC website.

1b-iv. Provide all relevant documents pertaining to a PFMC assessment-related agenda item embedded within the Council’s summary of agenda items for a given meeting.

1c: Meeting Accessibility

Virtual and hybrid meeting formats, especially in the wake of the COVID-19 pandemic, were widely credited with expanding participation but also criticized for reducing spontaneity and relational trust (i.e., fostered through face-to-face interactions and sidebar conversations). Focus group participants explained that *it is difficult for the general public, even those somewhat engaged, to navigate the available information*. Participants described virtual Council family meetings and STAR panels as coherent but transactional limiting nuanced discussion and informal interactions that typically occur during in-person sessions.

Several participants observed that text-based chat from virtual participation can fragment dialogue and obscure key points from the public record, and the Lynker team observed that several chat-based comments went unaddressed and unacknowledged at meetings. Similarly, at the SSC meeting held in Costa Mesa, CA, on November 14, 2025, and the Rougheye/ Blackspotted Rockfish and Sablefish STAR panel held in Seattle, WA, from July 14-18, 2025, the Lynker team observed that the productive, free-flowing dialogue across members was difficult to follow at times due to not knowing who was speaking at a given time, what their role was (i.e., associated in part to a lack of introductions), and some of the terminology used when discussing certain topics.

Converse to the benefits of face-to-face meetings, participants viewed purely in-person formats as inequitable for distant participants and those with limited time and/or travel budgets. Across focus groups, the preferred solution is a hybrid model that preserves virtual accessibility while reinstating face-to-face deliberation at critical junctures. Facilitated conventions, such as hybrid meeting protocols, structured clarification rounds, explicit time for feedback from virtual participants, and trained moderators, were seen as necessary to ensure virtual participation remains substantive and inclusive as the Council continues to employ hybrid meetings.

Virtual and hybrid meeting formats broaden participation by reducing barriers associated with time, travel, and cost, but they also change how relationships and trust are built in the context of the federal fishery management process. Focus group participants described virtual STAR panels and Council family meetings to have "*increased access and efficiency, but reduced informal relationship-building and sidebar communication.*" When efficiency replaces deliberation, nuance, tone, and trust (i.e., and intangible factors essential to consensus) can suffer. Physical presence fosters informal exchange and cross-role understanding that virtual platforms rarely replicate. Ensuring accessibility must therefore balance access equity with engagement depth. Overreliance on remote tools risks transactional participation, while exclusive in-person formats limit inclusivity. A well-designed hybrid approach should maintain transparency and inclusion without losing the social capital that underpins collaborative governance and management.

Recommended Actions:

1c-i. Continue employing comprehensive **hybrid meeting formats** combining remote accessibility with key in-person touchpoints (e.g., data workshops, STAR panels). For in-person components of these hybrid meetings, the Council should:

   a. Consider offering travel funds for underrepresented stakeholder groups.

   b. Implement meeting room configurations that are more receptive to larger numbers of public attendees (e.g., additional seats with table surface and electrical outlet access).

1c-ii. Develop **virtual facilitation protocols** (e.g., structured "clarification rounds," explicit time for feedback from virtual participants, designated moderators) to ensure balanced participation. Develop and audibly state hybrid meeting protocols at the start of each meeting; to foster accessibility from external individuals, these should include, but are not limited to:

a. The Chair should lead introductions of all meeting participants at the outset of the meeting, immediately following the statement of meeting protocols.

b. Participants, either online or in person, should raise their hand and be recognized by the Chair before speaking.

c. Participants should identify themselves before speaking.

d. Questions or comments on a presentation should be held until the end of the presentation rather than being asked as they arise.

e. All participant discussion should be exclusively through vocal input and not using text-based chat; designate a primary chat facilitator for record-keeping if electing to retain substantive discussion in chat.

f. Limit the use of acronyms and other technical "slang" unless previously defined during discussion on an agenda item.

g. Strictly adhere to the agenda as initially presented to allow attendance and participation from external parties interested in a particular agenda item.

h. Develop more standardized protocol for submission of public comment by remote attendees (e.g., have commenters send a chat to Council staff ahead of time with the topic of their comment to allow staff to intuitively organize comments).

1c-iii. Train chairs, moderators, and/or rapporteurs in **online deliberation and facilitation** techniques (e.g., using the North American Association for Environmental Education or NOAA Office for Coastal Management Digital Coast).

1c-iv. Improve and standardize **technical capacity** for virtual meetings to minimize issues and interruptions during discussion.

a. Direct Council staff to work with venue personnel beforehand to ensure compatibility with the PFMC meeting platform and A/V equipment.

b. Direct Council staff arrive early at the meeting venue to test the system and troubleshoot issues well before the meeting begins.

Theme 2 — Communication

Major Theme 2 is communication, defined here as the process through which individuals, groups, or organizations create, share, and interpret messages to convey meaning, influence understanding, and coordinate actions. In the social sciences, communication is not just the exchange of information, *it is a dynamic, interactive process* shaped by context, culture, relationships, and power dynamics (McQuail, 2010). Effective communication involves encoding, transmitting, and decoding messages in ways that are understandable and meaningful to the intended audience, and it plays a central role in building trust, facilitating cooperation, and enabling collective decision-making. Scholars in sociology, organizational behavior, and political science emphasize that communication is both a symbolic and relational process; it conveys factual content as well as social signals about intentions, credibility, and authority.

Scientific uncertainty, as an example of an often-confusing aspect of fisheries science, is an integral part of stock assessments, but how that uncertainty is conveyed determines whether stakeholders interpret results as credible or confusing. When technical terms like confidence intervals, data-limited, or model sensitivity are not clearly defined, participants perceive inconsistency or lack of clarity and may even draw their own assumptions. This gap in translation can lead to surprise results when assessments have negative implications to fishery operations, fueling skepticism about the scientific process itself. Clear communication of uncertainty should not oversimplify but contextualize concepts so that managers and stakeholders can understand what is known, what is uncertain, and that decisions still rest on the best available science. Consistent language across the SSC, Council, and associated public forums will reinforce trust and ensure that the process remains both transparent and scientifically sound.

2a: Scientific Communication

Participants agreed that PFMC's scientific products are credible but often difficult for non-technical audiences to interpret. A stakeholder and process participant admitted they "*[sometimes] don't understand the language they use*," while an SSC member noted that most people, including many scientists, lack the qualifications to fully grasp the complex mathematical and statistical models.

The application of the PFMC's integral P*-based framework results in many stakeholders that "*people don't really get the uncertainty*." Focus group participants described that random draws under the P* uncertainty distribution can cause the associated overfishing limit (OFL) to appear 60–70 percent too high or too low. A broader point was that the level of uncertainty inherent even in data-rich assessments drives false alarms and perception issues, since the PFMC lacks a clear protocol to handle results with such large ranges. Participants noted that misunderstandings about uncertainty generate "*false alarms*" when new harvest limits appear more conservative than expected.

Process participants expressed that there is, at times, a lack of clarity when buffers accounting for uncertainty are applied. "*I think some of them are transparent, particularly the ones that occur*

after the OFL is set… The ones that concern me are the ones that happen before that and how they are set." Additionally, focus group participants referenced P* in the context of risk communication. Participants clarified that "*we have P*... a perception of risk. It's not tied to an individual assessment's uncertainty*," emphasizing that while P* represents a policy-level risk tolerance, many participants confuse it with model-specific uncertainty.

To the credit of the Council family, at the SSC meeting held in Costa Mesa, CA, on November 14, 2025, members were aware of this gap in communication, stating the body should "*look at input from the public. Where can we provide more detail about the nature of sensitivity? How can we learn from this experience? They want to understand the difference between fishery and survey data; we should develop protocols to communicate that better*."

We emphasize communication of scientific concepts (e.g., uncertainty, risk) as a core issue undermining trust. Participants recommended using standardized visuals, plain-language glossaries, and short pre-briefings to demystify scientific terminology and aspects.

Recommended Actions:

2a-i. Standardize **expression of uncertainty** and related, confusing terms across all assessment documents and presentations (inclusive of notions such as confidence intervals, P*, sensitivity analyses, risk summaries, etc.).

   a. Encourage assessment scientists and managers to explicitly identify where buffers accounting for uncertainty are applied both within the modeling process (e.g., P* processes as well as during model development) and during the management process (e.g., determination of OFL, ABC, ACL).

2a-ii. Include **brief, intuitive definitions** of technical terms in public-facing reports.

   a. Ensure public meeting participants (e.g., SSC members) define terms and acronyms before using them in discussion (related to Recommendation 1c-ii below).

2a-iii. Deliver **plain-language pre-briefings** for Council family and stakeholder audiences prior to presentation of results (e.g., emphasizing how uncertainty affects management risk).

2a-iv. Provide optional **"Science Communication 101" modules** for new Council or advisory body members (related to Recommendation 2c-i below and Appendix C); offer these materials to stakeholders and the public upon request.

2b: Intra-Council Communication and BSIA Determinations

Communication between the SSC, Council members, Advisory Bodies, and NMFS personnel was frequently described as inconsistent and sometimes circular. A focus group participant noted that *there are different levels of understanding of the TOR depending on who you ask*," while another said, "*[the Council] gets the scientific recommendation from the SSC… then [the Council] decides on things like management uncertain and level of risk… slightly iterative thinking about implementing meaning measures based on what comes out of the stock assessment* ." At the SSC meeting held in Costa Mesa, CA, on November 14, 2025, an SSC member stated that they were

"*concerned that the SSC is applying different standards of review based on how palatable the results are… introducing bias into the process from a scientific point of view*." These blurred lines cause duplication and tension, with Council members occasionally revisiting resolved scientific issues and SSC members feeling the need to consider management implications while reviewing scientific processes.

We document the need for clearer delineation between BSIA certification and policy deliberation, cutting both ways. Participants supported the idea of dedicated "*BSIA Briefings*" at Council meetings to clearly delineate determinations of resolved science as identified by the SSC. On the other side, participants advocated for a formal mechanism allowing the Council to request SSC reevaluation when new data, information, or other uncertainties emerge, provided it does not reopen settled science. These steps were viewed as essential for protecting both independence of distinct scientific- and management-focused bodies as well as accountability to stakeholders and the public.

The boundary between scientific certification (i.e., by the SSC) and policy adoption (i.e., by the Council) is central to the PFMC's credibility. When communication among SSC members, Council, Advisory Bodies, and NMFS staff is inconsistent, the process can appear unclear and redundant. Misalignment can cause the Council to revisit resolved scientific matters or pressure the SSC to consider management trade-offs sometimes in contrast with science. These overlaps blur accountability and weaken public confidence in BSIA determinations. Clear, structured communication channels maintain role integrity while promoting shared understanding. By institutionalizing procedures for information exchange and clarification requests, PFMC can safeguard scientific independence and strengthen the legitimacy of its related policy decisions.

Recommended Actions:

2b-i. Improve upon existing communication of BSIA determinations to the Council and its advisory bodies with dedicated "**BSIA Briefings**" during Council meetings that summarize SSC determinations, key assumptions, and rationale in concise, plain language and capturing rationale of BSIA certification to ensure consistent interpretation of scientific advice, especially in instances of potentially unexpected results.

   a. Establish and utilize a simplified BSIA Briefing template for consistency over time (see Appendix B for an example template).

2b-ii. Establish a **technical referral protocol** allowing the Council and its advisory bodies to submit specific, newly available data or identified technical uncertainties to the SSC, allowing the SSC to determine, based on NS2 criteria, whether the existing assessment continues to represent BSIA or if a supplemental review is required to maintain scientific rigor.

   a. Define strict technical triggers to allow for the Council to request the SSC to reevaluate BSIA determinations. For example, the Council may consider reevaluation associated with:

i. Results indicating significant model divergences (e.g., when new data points fall outside the 95% confidence intervals of the previous model's projections);

ii. The availability of a new, peer-reviewed data source not available during the initial STAR panel review; and/or

iii. The identification of a calculation or data-processing error that fundamentally alters stock status determination.

b. Consider a two-tiered review process distinguishing between minor technical corrections and full reevaluations.

c. Clearly separate scientific review and policy deliberation in meeting agendas, with explicit identification of items that are technical in nature versus those intended for management decision-making.

We acknowledge that this recommendation may be perceived as a tool for the Council to "shop" for more favorable scientific outcomes when they disagree with associated management implications. Rather than a discretionary management request, this mechanism is meant to provide another layer of rigorous technical review, with relevant triggers. We also emphasize that National Standard 2 allows the SSC to reevaluate if it determines that existing information no longer constitutes BSIA. We emphasize that, here, the Council would not be directing a change in findings but referring specific technical questions to the SSC for a BSIA Certification Update. The SSC retains the final authority to decide if the new information warrants a full reevaluation or if the existing assessment remains BSIA.

2b-iii. Host periodic **cross-body workshops** to align expectations, share lessons, and foster mutual understanding across science and policy roles.

2c: Advisory Body Orientation and Onboarding

Across focus groups, advisory members, especially new appointees, described steep learning curves and inconsistent onboarding practices. Focus group participants said, *"{we aren't} sure exactly when or how to provide input,"* and *"the stock assessment process is rigid, complicated, and often intimidating."* Many cited inconsistencies across advisory bodies and a need for standardized guidance. Others noted that lack of orientation discourages newer voices from contributing, leaving discussions dominated by longer-serving members.

Advisory bodies function as a connective network of PFMC processes, linking scientific expertise with stakeholder perspectives; their members interpret complex scientific information and channel local, industry, and community perspectives into scientific determinations and policy deliberations. When new members enter without structured orientation, they spend months learning terminology, processes, and expectations instead of immediately contributing perspectives and expertise. Inconsistent onboarding leads to uneven participation, reinforces reliance on long-tenured members, and limits diversity in representation. Effective orientation can convert turnover into renewal by effectively transferring institutional knowledge, building

confidence, and ensuring that new voices can meaningfully engage. Effective orientation also supports inclusion and diversity by lowering barriers for participants from nontraditional backgrounds. From a governance standpoint, onboarding is a strategic investment in social capital that maintains both institutional knowledge and fairness with respect to participation in the Council's stock assessment review process.

We highlight advisory body member knowledge transfer as an essential part of cultivating capacity to feed into the PFMC's assessment review process. Participants emphasized that structured onboarding would improve participation equity and confidence. Project team members proposed a recurring Advisory Body Bootcamp, mentorship pairings with former or long-standing members, and concise handbooks outlining procedures, timelines, and acronyms. Our team added that open "office hours" for Council staff between meetings would lower barriers for questions and sustain engagement.

Recommended Actions:

2c-i. Develop a recurring **"Advisory Body Bootcamp"** covering Council structure and procedures, stock assessment flow, engagement pathways, and advisory responsibilities.

   a. Make optional refresher modules available on demand.

This program should provide a structured, recurring orientation and refresher program for members of PFMC advisory bodies to build a shared baseline understanding of PFMC processes, reduce procedural misunderstandings that escalate into conflict, and improve the quality and timeliness of advisory input. See Appendix C for an example structure of this bootcamp.

2c-ii. Pair new advisory body members and SSC appointees with rotating **alumni mentors** for informal guidance during their first year.

2c-iii. Encourage Council staff to host periodic **office hours** for informal questions and peer exchange from both stakeholders and advisory body members outside of formal meetings. This would entail blocking off a regularly scheduled set amount of time (e.g., 1-2 hours monthly) on a consistent basis for in-person or virtual (i.e., with a standing virtual meeting link) discussions, questions, and collaborative problem solving.

   a. Communicate upfront what topics are appropriate, how to prepare (e.g., brief agenda or materials shared in advance when feasible), and how time will be managed if multiple participants attend.

   b. Utilize a simple sign-up or queue system during periods of high demand.

   c. Track recurring questions and issues to identify patterns and use this information to improve documentation, training, and/or processes.

   d. Periodically assess attendance and usefulness and adjust the format, frequency, or focus to better meet Council needs.

2c-iv. Consider expanding upon the existing Advisory Body Fact Sheet and Advisory Body Ground Rules to produce a concise **Advisory Body Handbook** with meeting and communication protocols, key contacts, glossaries of commonly used terms, and other useful tips.

This Handbook should contain similar content as the Council Operating Procedures for Advisory Subpanels and Plan, Technical, and Management Teams, etc., but function as a standalone document that is easily distributable and approachable.

Theme 3 — Stakeholder Engagement

Major Theme 3 is stakeholder engagement. Our team heard much regarding the incorporation of local ecological knowledge (LEK). This refers to the place-based, experiential understanding of environmental conditions, species behavior, and ecosystem change that is developed and transmitted within communities over time. LEK is understood not simply as a body of information, but as a socially embedded knowledge system shaped by cultural practices, livelihood strategies, social networks, and community institutions. LEK is produced through continuous interaction between people and their environments, and is maintained through observation, shared narratives, apprenticeship, and collective decision-making.

LEK is important because it reveals how communities interpret ecological signals, respond to environmental change, and negotiate stewardship responsibilities. It highlights the co-production of knowledge between humans and ecosystems, showing that what people know is inseparable from the social contexts in which they live, such as gender roles, fishing practices, land tenure systems, and intergenerational transmission of norms. It also contributes to procedural justice and collaborative governance by legitimizing community voices, building trust, and enriching management decisions with fine-grained, temporal insight often unavailable through scientific monitoring alone.

Perspectives, cooperative data, and LEK (e.g., industry catch information, fisher observations, Tribal ecological records) represent vital sources of insight often absent from formal stock assessment inputs. When such information is introduced too late in the cycle, or not at all, it can no longer inform model design or review, leading stakeholders to feel excluded from the science development process. Stakeholders believe that science should describe the real world, and industry perspectives can help in validating assumptions and resolving discrepancies. Early inclusion transforms participation from passive consultation into co-production of knowledge, enhancing the credibility, contextual accuracy, and social legitimacy of PFMC scientific review. Integration also improves data completeness and helps assessment scientists identify anomalies or errors earlier, reducing costly revisions later. For PFMC, this practice will build process fairness, strengthen the partnership between management and fishing communities, and reinforce the perception that assessments reflect both analytic rigor and lived experience.

3a: Early Integration of Local and Cooperative Data and Perspectives

Participants repeatedly stressed that LEK and cooperative data and perspectives are introduced too late to influence assessment design. Focus group participants observed, *“Timing is key as far as important groups being represented because... the STAR panel is way too late. It has to be early in the process.* "Participants noted that early inclusion of fishery logs, survey and empirical observations, and LEK would improve model realism and trust, and incorporation of fishermen’s perspectives would foster additional buy-in from stakeholders during the assessment review process. Stakeholder skepticism is heightened when stock assessment model outputs directly contrast their on-the-water observations and experience.

At the SSC meeting held in Costa Mesa, CA, on November 14, 2025, the Lynker team observed a public comment by an industry member who stated that it is "*...worth considering what we're looking at here, an assessment that doesn't have a lot of info reflecting what we're seeing on the water*." We also observed submission of multiple public comments by industry representatives that stated similar sentiments such as "*Fishermen on the water are your best avenue for near real time data… valuable insight, but doesn't feel like it's being used very well*," and "*Fishermen's perspectives can be valuable to assessments when we're missing data like this. Scientists need more collaboration with the industry. Not sure how we make time for that, but open to ideas*." Additionally, a public comment at the same meeting offered that "*With all the federal cuts to funding for data, we need for fishers and want to find pathways to have vessels already fishing to provide data that support questions advisory bodies are asking… Please reach out to us, come to the GAP, and talk to industry members that come to the Council meetings*."

These comments emphasize a recurring observation of the Lynker team, through focus groups and attendance at relevant Council family meetings, that industry members and related stakeholders are eager to work with NMFS scientists and the Council to better understand available data, provide additional data, and otherwise be more involved in the assessment development and review process. We believe industry representatives do possess valuable knowledge about fish stocks, fishing grounds, and changing fishery and environmental conditions. However, these stakeholders tend to feel that they are not meaningfully included or provided sufficient time in relevant dialogues, and their input is not taken seriously when offered, often resulting in frustration, lack of buy-in, and reduced participation going forward. These perspectives align with statements by the PFMC's Groundfish Advisory Subpanel (GAP) in its reports to the Council in November 2024 (Supplemental GAP Report 1, Agenda Item D.3.a) and June 2025 (Supplemental GAP Report 1, Agenda Item E.7.a).

We highlight the delay or lack of consideration of empirical data and perspectives, especially from industry members that are willing to contribute, as a structural barrier to transparency and call for clearer guidance on how data and perspectives are ingested into the assessment development and review process. Participants proposed early data workshops to take place well before STAR panel scoping as opportunities for co-production of knowledge. Scientists also referenced the utilization of similar mechanisms in recent years (e.g., for sablefish reassessment, similar to SEDAR [SouthEast Data, Assessment, and Review] processes"). Participants noted that "*Data workshops have become more common whereas, in the past, that was something that was done only for certain stocks, or it was up to the assessors to reach out to the industry on a more informal basis*," and we propose formally expanding upon this approach given that "*Are we where we want to be in terms of participation? No, but it is growing*."

Summaries showing how LEK and cooperative inputs are incorporated, if at all, were viewed as critical to demonstrating accountability and respect for local, applied expertise. The Lynker team also learned from stakeholders that other approaches, such as a process or survey/questionnaire to capture LEK preceding each assessment and fishery-specific training for assessment authors about the importance of industry input, were proposed as viable solutions.

Recommended Actions:

3a-i. Prioritize two-tiered, **early data workshops** preceding assessment cycles, emphasizing windows for LEK, observations, and cooperative-data submission.[3]

a. Present the implementation of these data workshops as a collaborative initiative alongside NMFS with the goal of making the stock assessment process more transparent and facilitate greater incorporation of LEK to inform scientists regarding the nature of data to be used in the assessment.

b. Consider formally incorporating these data workshops into the STAR process to ensure it remains part of the assessment framework for posterity.

c. Employ these data workshops primarily for benchmark or research-track stock assessments at least one year preceding a STAR panel for a given stock or assessment cycle.

d. Led by NMFS scientists, the first data workshop should comprehensively review all available data for the management unit species intended for stock assessment, including what data may plausibly inform assessment scoping or assumptions (e.g., catch, catch-per-unit-effort, life history, length, relative abundance indices from fishery independent surveys, historical catch information predating current monitoring programs, etc., including metadata, from all relevant sources). Following review of each data stream, fishing industry and community representatives should be granted the opportunity to provide context to the nature of the data source and apparent trends.

e. Following the first workshop, the Council and NMFS should provide summaries of all the potential data inputs discussed to workshop participants.

f. The Council and NMFS should then hold a data workshop feedback meeting (i.e., a second data workshop) in which scientists present how they used the information provided in the first workshop to improve the data inputs for the benchmark stock assessment. At this stage, scientists can also address why certain data can or cannot be used for a given assessment cycle. This approach facilitates a shared understanding of how data are used to level-set expectations for the assessment during review.

g. Consider pairing these workshops with additional tools such as a survey or questionnaire to glean additional stakeholder perspectives for those unable to attend during the formal workshop date and time.

h. Consider piloting this approach with one or two high interest stocks using a hybrid meeting approach.

[3] The Lynker team utilized the Pacific Islands Fisheries Science Center's (PIFSC) data workshop structure as a model to suggest implementation of a similar process for the West Coast.

We note that implementing this approach would be consistent with the TOR in that outcomes would not constrain or pre-judge scientific decisions. Rather, the workshops would support TOR objectives through improving early identification of potentially relevant or problematic data streams, allow assessment teams to flag data limitations before modeling begins, and reduce the likelihood that unresolved data disputes arise during STAR panel review, when flexibility is more limited. We further note that BSIA guidelines under National Standard 2 of the MSA require that Councils use the BSIA, while recognizing that BSIA does not mean all information must be used, nor that information must be perfect to be considered. The proposed approach would broaden the potential availability of information (e.g., LEK and cooperative research) without altering data quality standards, analytical thresholds, or criteria for incorporation into assessments. Implementation of these workshops would not prescribe substituting stakeholder preference for scientific analysis, but rather allows LEK to inform hypotheses, assumptions, and diagnostics, effectively improving procedural fairness without weakening scientific rigor.

3a-ii. Develop standardized, public **"data-use memos"** showing how external inputs were applied, accepted, or deferred, with rationale, to foster transparency and trust (in addition to justification for management outcomes) This approach would explicitly illustrate that external inputs are seriously considered, allow decisions to follow consistent assessment criteria, and express that deferral does not equate dismissal.

   a. Finalize memos prior to the STAR panel and included in the assessment document package. These documents are not necessarily subject to STAR approval but made available for context. We note that no new review criteria are introduced, preserving the independence and rigor of the STAR process.

We note that these memos may support TOR expectations for documentation and transparency by providing a transparent, standardized record of how external inputs were evaluated, clarifying why some data were deferred or deemed out of scope, and reducing ambiguity for reviewers, Council members, and stakeholders. We further note that these memos would support BSIA guidance that information considered when relevant, evaluated transparently, and applied consistently with scientific rigor through documentation of evaluation criteria, technical and policy constraints, and justification for data incorporation, conditional use, or deferral. See Appendix D for an example template of a data-use memo.

3a-iii. Offer **training to scientists** on interpreting LEK and integrating qualitative data into model scoping discussions and assumptions (i.e., akin to participatory modeling as described in Mendoza & Prabhu, 2006).

   a. Consider training such as formal courses on participatory engagement (e.g., Social Science in Conservation) and review of reference materials and case studies (e.g., from the ConSoSci Partnership Training Library).

   b. Consider approaches leveraging participatory mapping (as described in Risley et al., 2025) to visualize LEK (e.g., spatial patterns of fishing, habitat use, and/or seasonality) or semi-structured interviews (e.g., Silas et al., 2023).

We note that embedding concepts surrounding the integration of LEK into the organizational structures supporting scientific processes led by the Council and NMFS can sustain them going forward; e.g., mentorship and peer learning (see Recommendations under Subtheme 2c), updating standard operating procedures, and developing metrics for ongoing evaluation (see Recommendations under Theme 5).

3a-iv. Encourage NMFS to cultivate cooperative data collection and/or research programs for groundfish fisheries, facilitating additional information in areas, depths, and at times current fishery-dependent and fishery-independent data collection does not cover (e.g., due to lack of market or quota by fishermen residing or fishing in those locales).

   a. Formalize Memorandums of Understanding (MOUs) with state, Tribal, and industry partners for additional cooperative data collection where feasible.

We note that further implementing cooperative data collection can facilitate integration of LEK as described in Recommendation 3a-iii (see Hartley & Roberston, 2009).

3b: Pre-Assessment Engagement

Stakeholders valued early engagement sessions but found them variable and dependent on individual initiative. Engagement before modeling begins is consistently viewed as the current most productive point of interaction. When stakeholders are invited to discuss data quality, assumptions, and intended model frameworks before the assessment, they develop shared ownership of both process and output. Pre-assessment engagement helps surface misunderstandings early, allowing issues to be resolved before they become conflicts at the STAR panel or Council level. This early collaboration improves scientific inputs and builds capacity and equity in participation, especially for communities or sectors less familiar with technical components of an assessment. Continued interactions throughout the assessment process would further bolster these aspects.

Focus group participants remarked, *"Data workshops have become more common whereas in the past that was something that was sort of done for only certain stocks, or it was up to the assessors to reach out to the industry and do it on a more informal basis*." Several participants said that pre-assessment conversations "*set the tone*" for trust and reduce later contention. At the SSC meeting held in Costa Mesa, CA, on November 14, 2025, the Lynker team observed a public comment by an industry member referencing the widow rockfish stock assessment, stating that there is an "*Incompatibility of model and what's going on in the ocean*," and expressed a desire to identify incompatibilities (i.e., between the assessment model and reality) at an earlier stage.

The Lynker team learned from stakeholders that the Council encourages industry engagement at pre-assessment workshops to share information from the fishermen's perspective. However, stakeholders indicated that they already provide input at that stage in the process, and it is not always clear if or how it is incorporated into the assessment itself; we note that the Council may be able to further address these perceptions through Recommendations 5c-ii and 5d-i under Theme 5 below. They also believe that engagement at this stage, while valuable, precedes the

assessment being finalized and released, so there should be opportunities for this type and engagement throughout the entire assessment cycle.

We encourage further incorporating opportunities for early (and ideally, continuous) engagement as a recurring stage in the assessment cycle. Participants urged PFMC to institutionalize pre-assessment workshops with clear objectives, standard "data-packet" templates, and hybrid access options for remote fishers. Participants noted that they see the early sessions as the most efficient point for clarifying assumptions before conflicts escalate at STAR panels and subsequent engagement points.

Recommended Actions:

3b-i. Continue and expand **pre-assessment workshops** as a standard phase in each assessment cycle. Adjustments that the Council can consider may include:

- a. Formalize these meetings as a standard phase in the TOR well before assessment work begins to ensure stakeholder-identified data gaps and issues can be addressed by the STAT.
- b. Expand scope or leverage expanded data workshops to provide dedicated time for data interpretation and context (e.g., changes in fleet behavior, survey anomalies, etc.) in lieu of focusing solely on data inventory, clearly articulating what data will and will not be used and why. There may also be benefits from the early identification of high-risk assumptions that have potential to drive outcomes.
- c. Formalize participation and roles for assessment scientists, advisory body representatives, and industry representatives with empirical knowledge.
- d. Improve documentation and follow-through by developing a brief, standardized summary of takeaways from each workshop (e.g., data accepted/excluded, key uncertainties identified, issues deferred to later stages, etc.) and link outcomes to STAR Panel materials and SSC review context.
- e. Leverage hybrid formats to broaden access while prioritizing in-person engagement (consistent with Recommendation 1c-i).
    - i. Ensure travel support for underrepresented participants.
- f. Invest in facilitation instead of one-way presentations, allowing discussion to be guided toward shared understanding, clarification of disagreements, and documentation of unresolved issues.

3b-ii. Additionally, related to Recommendation 3b-i, consider encouraging **additional engagement points** for stakeholders with the STAT, specified at the pre-assessment workshop, to take place through the cycle after scientific assessment begins (e.g., "checkpoint meetings").

- a. Consider conducting a mid-cycle webinar after data processing to present preliminary model structures and initial base case results.

b. Consider using these sessions to discuss more minor decisions like the choice of priors or fleet stratification before they become more rigid in later drafts/versions.

c. Encourage participation of GAP and GMT representatives to provide management perspectives on early findings.

3b-iii. Explore partnerships with **the Marine Resource Education Program (MREP)**or similar programs to adapt early learning modules for stakeholder audiences.

3c: Assessment Education and Training

Focus group participants praised existing education efforts relevant to fisheries science and stock assessments, such as Dr. Jason Cope's (NWFSC) seminars and MREP. Understanding the scientific basis and constraints of stock assessments is key to meaningful participation. Without structured education, stakeholders and even some advisory members can misinterpret the nature of what constitutes meaningful inputs, as well as model outputs, leading to avoidable tension during deliberations. Informal workshops have proven effective but remain voluntary and disconnected from formal PFMC processes. Institutionalizing educational opportunities would strengthen mutual understanding between scientists, Council members, and stakeholders. A culture of continuous learning enables adaptive management, reduces conflict rooted in misunderstanding, and sustains participation by making science accessible to all sectors.

However, participants also indicated that education remains optional and disconnected from formal assessment processes and cycles. Focus group participants observed, *"Unless you have context for what an assessment is showing, you can't really give them the input that would be beneficial."* Advisory members described confusion in understanding what input would be useful and struggling to interpret outputs, which has led to frustration and mistrust. Relevantly, participants also offered that sometimes, provided input is not specific or relevant enough to enact meaningful change, emphasizing a need for a greater collective understanding of assessment science.

We point to standardized learning modules as a key reform. Participants suggested embedding recurring MREP-style sessions directly in the PFMC calendar, with cross-attendance by scientists, the SSC, and advisory members. They stated that educational investments are not side projects but integral to effective and equitable participation.

Recommended Actions:

3c-i. Integrate **formal education sessions** (e.g., MREP) into PFMC's outreach processes and encourage cross-attendance between NMFS analysts, SSC, and advisory bodies in these sessions to build shared vocabulary, expectations, and understanding (related to Recommendation 3b-iii).

3c-ii. Use standardized **data use memos** (see Recommendation 3b-ii) as education materials for process participants and stakeholders.

3c-iii. Develop accessible **educational videos or briefing papers** explaining core concepts (i.e., “Quick Bytes,” explaining, e.g., uncertainty, risk, model fitting) that can be housed on the Council’s YouTube page.

Theme 4 — Assessment Process Cadence

Major Theme 4 pertains to the cadence and timing of the assessment process. Organizational-capacity theory (Honadle, 1981) examines the resources, structures, and internal processes that enable an organization to perform effectively and achieve its mission. In this framework, capacity is understood as a multidimensional construct that includes technical skills, staffing and leadership, financial resources, governance systems, organizational culture, and the ability to learn and adapt. Scholars emphasize that capacity is not static; it develops over time as organizations accumulate experience, formalize procedures, invest in workforce development, and build strategic partnerships. Effective capacity allows organizations to absorb new responsibilities, manage uncertainty, and deliver consistent, quality outputs even as external conditions shift.

From a social science perspective, organizational-capacity theory also highlights the relational and institutional factors that influence performance. Organizations do not operate in isolation; they depend on networks, enabling policies, community legitimacy, and trust-based relationships with stakeholders. Capacity therefore includes the ability to collaborate, coordinate across sectors, communicate clearly, and navigate power dynamics. In environmental and community-based settings, strong organizational capacity enhances the effectiveness of co-management, collective action, and cross-jurisdictional initiatives, because it supports transparency, responsiveness, and adaptive learning. Investing in organizational capacity is thus seen as essential for long-term sustainability, resilience, and the ability to translate strategic goals into durable, measurable outcomes.

Persistent staffing shortages, analyst turnover, and flat budgets have created structural bottlenecks that constrain the ability of NMFS and the Council to maintain assessment frequency and review depth, respectively. Participants frequently described "*doing more with less*," often performing overlapping roles with little recovery time between cycles. These limitations not only delay assessments and their review but also threaten the quality and consistency of output; this has the potential to weaken the perception of BSIA. Resource constraints also impact workload distribution, where highly experienced individuals carry disproportionate burdens, accelerating burnout and loss of institutional knowledge. Addressing these constraints is central to maintaining assessments' credibility and scientific rigor at the review stage. Stable human and financial resources are the key infrastructure of trusted management.

Focus group participants, especially analysts, also emphasized that long intervals between stock assessments affect not only analytical workload but also stakeholder trust, as infrequent benchmarks can produce large, unexpected changes in stock status and catch advice that are difficult for stakeholders to anticipate or contextualize. Participants noted that more frequent, incremental assessments, even if less comprehensive, can help maintain continuity in shared understanding and reduce the likelihood of contentious outcomes.

4a: Resource Constraints

Participants across nearly all focus groups cited staffing shortages and shrinking budgets as the single greatest threat to assessment quality, now and going forward. Focus groups relayed, *"Part of the reason that we can't do assessments so frequently…is just because we have too many stocks to cover and not enough assessment scientists."* Science providers reported that turnover at both PFMC and NMFS has diminished institutional memory, forcing new staff to relearn old lessons. Interviewees noted repeated concerns about "*thin benches*" and burnout among key reviewers. At the SSC meeting held in Costa Mesa, CA, on November 14, 2025, the Lynker team observed discussions by members acknowledging that those involved in the assessment review and adoption process are generally at capacity, and forms of evaluation that involve extensive, iterative refinements and supplemental reviews were emphasized. One member noted that it "*may make sense to adjust timelines and related decisions in the future*."

We also acknowledge the West Coast's assessment process as already being incredibly well organized and systematic while offering flexibility; while a more regimented process may lead to higher data quality, it would notably slow the process. Participants noted that "*There's pluses and minuses to it. I think we have a lot of freedom that you don't have under some of the other processes in other parts of the country… but the biggest issue we have is throughput in terms of getting things done.*" Assessment scientists believe that standardizing data inputs with approved methodologies may lessen burdens on assessors going forward.

We recommend further integrating workforce planning into annual prioritization. We acknowledge that the Council already utilizes a structured prioritization and workload planning process, but it is often characterized by a "bottom-up" approach where individual needs are balanced against fluctuating regional capacity. The recommendations provided below are intended to move the Council toward a more integrated, proactive, and "top-down" strategic framework to address the capacity constraints and stakeholder tensions. Participants also suggested cross-training assessment scientists, extending contract lengths, and smoothing workloads across cycles so expertise and morale can be sustained.

Recommended Actions:

4a-i. Further integrate **workload planning** into annual prioritization in collaboration with NMFS to realistically address necessary assessment outputs each year; work to address prohibitive timelines and requirements present in federal regulations and/or FMP provisions, ensuring that the Council's need for new assessments and management measures aligns with the actual personnel and financial capacity of the NMFS Science Centers and Council staff via front-end alignment. To enact this process, acknowledging that this must be a joint effort by the Council and its scientific partners to ensure buy-in from all parties, we suggest continuing and/or implementing the following:

   a. Ensure continued, direct consultation between Council leadership and Science Center leadership occurring annually to align long-term strategic goals with available budget and personnel.

b. Leverage advisory bodies to help identify and review proposed workloads (e.g., which stocks require benchmark or update assessments based on scientific urgency and data availability within the shared BSIA Framework) for a given year against capacity limits.

c. Continue formalized annual sessions during Council meetings dedicated to reviewing and adopting prioritized work plans for the following year. During assessment prioritization exercises, formalize approaches that map proposed assessments against scientific urgency, management priority, and required personnel and budget.

d. Request a formal assessment of capacity (i.e., a staffing forecast) from NMFS (expanding on current workload reports), and generate one for Council staff, to confirm the necessary resources and personnel are available for projected assessment schedules without jeopardizing current management goals.

4a-ii. Streamline **review layers** and reduce redundancy (e.g., avoid overlapping review sessions and/or re-deliberating well-established models) where possible to mitigate issues associated with capacity constraints (see Subtheme 4b and Recommendation 4b-ii below for additional detail).

a. Prioritize assessment approaches that reduce long gaps between scientific updates, recognizing assessment frequency as a trust-building and expectation-management tool in addition to a capacity consideration.

4a-iii. Prioritize internal and request NMFS implement **multi-year or rotating funding structures** to stabilize assessment staffing and reduce turnover, ensuring robust capacity throughout the lifecycle of an assessment.

4a-iv. Request NMFS to expand assessment **scientist cross-training** to mitigate impacts associated with staff loss and turnover.

4b: Process Fatigue

Focus group participants described overlapping reviews and continuous meetings that leave little time for reflection. Cumulative workload, extensive evaluation, and long meeting durations have created an environment characterized by fatigue for analysts, reviewers, and Council participants. Focus group participants described this as "*exhausting"* and with "*crazy overlap.*" When staff and reviewers are exhausted, creativity, open-mindedness, and collaboration decline. Fatigue pushes participants toward risk-averse decisions, perpetuating perceived procedural rigidity and discouraging innovation; virtual meeting saturation has intensified this strain. Process fatigue is a human resources issue and a governance risk, as diminished reflection time undermines scientific quality and erodes institutional trust.

Although the current process is scientifically rigorous and transparent, it has become highly layered, with multiple review bodies examining similar technical material under compressed timelines. These redundancies do not substantially enhance scientific rigor and instead

contribute to inefficiency, increased workload for assessment teams and reviewers, and confusion for stakeholders about where final scientific judgments reside.

Redundancy occurs most notably between STAR Panels and subsequent SSC review. STAR Panels are charged with in-depth technical peer review and determination of whether an assessment meets BSIA standards, yet SSC review often revisits many of the same technical issues related to data adequacy, model structure, and uncertainty. This duplication, sometimes involving the same individuals, can result in re-litigation of issues already addressed through peer review. Additional overlap occurs at the interface between STAR Panels, the GMT, and the SSC, where technical discussion may extend beyond STAR and into management forums. When these reviews occur on overlapping timelines, management bodies may have limited opportunity to fully absorb STAR conclusions before advancing recommendations, weakening the intended stepwise structure of the process.

Limiting redundant review steps does not imply reducing transparency or weakening peer review. Rather, it requires clearer differentiation of roles and greater confidence in STAR Panel conclusions once rendered. Focus group participants remarked, *"...so many things overlap ... star one ... on top of star two deadlines ... on top of things that are happening with the... Council meeting and everything is so overlapping."* Others admitted they sometimes disengage from virtual sessions out of exhaustion. The Lynker team observed how cycle compression diminishes creativity and risk-taking, while other participants acknowledged a growing sense of endurance rather than collaboration. Participants called for a spaced, three-stage STAR structure with defined rest periods, rotation of review duties, and clearer distinctions between technical and policy deliberations. These changes were framed as essential to maintain scientific rigor and human sustainability.

The proposed three-stage STAR Panel review process (see Recommendation 4b-i below) restructures the existing peer-review framework into a sequenced set of purpose-specific interactions that separate orientation, technical evaluation, and final judgment. The intent of this approach is to preserve the rigor and transparency of the current STAR process while reducing time compression, improving clarity of reviewer expectations, and supporting more deliberate consideration of uncertainty. The three-stage STAR process consists of (1) orientation and scoping, (2) technical review and iteration, and (3) synthesis and conclusions, separating problem definition, analysis, and judgment to improve review quality, efficiency, and transparency. Together, these three stages distribute review effort over time, reduce reliance on compressed decision-making, and strengthen the link between technical review and clear communication of outcomes. The result is a STAR process that remains rigorous while better supporting shared understanding, reviewer sustainability, and informed Council decision-making.

Recommended Actions:

4b-i. Rebalance workload through a **spaced, three-stage STAR process**, allowing time for reflection between reviews.

a. The first stage consists of an orientation and scoping session that occurs at the outset of the STAR process. During this stage, the stock assessment team presents a concise overview of the assessment objectives, data sources, key assumptions, and known limitations. STAR Panel reviewers use this session to identify priority areas for review, clarify the scope of their evaluation, and specify any diagnostic analyses or sensitivity runs they would like to see before drawing conclusions. This early alignment establishes shared expectations, minimizes later misunderstandings, and ensures that subsequent technical work is focused on the issues most relevant to determining assessment adequacy.

b. The second stage focuses on technical review and iteration. This stage is conducted after the stock assessment team has had sufficient time to address reviewer requests from the initial scoping session. Reviewers evaluate the additional analyses, examine model behavior and uncertainty, and engage in structured discussion regarding data limitations, assumptions, and robustness of results. The emphasis during this stage is on technical adequacy rather than final judgment. Any remaining areas of disagreement or uncertainty are clearly identified and documented, along with an understanding of whether they can be resolved or must be carried forward as caveats.

c. The third stage centers on synthesis and conclusions. At this point, the STAR Panel deliberates on the overall adequacy of the assessment and whether it meets Best Scientific Information Available standards. The panel articulates the assessment's strengths and limitations, clearly describes the role of uncertainty, and documents any conditions or considerations relevant for management use. This stage culminates in the development of clear STAR conclusions that are intended to be transparent, defensible, and readily interpretable by the Scientific and Statistical Committee, the Council, and stakeholders.

4b-ii. Limit **redundant review steps** and overlapping deadlines (consistent with Recommendation 4a-iii).

a. Affirm STAR Panels as the primary venue for technical peer review and BSIA determination, with post-STAR reconsideration limited to clearly defined circumstances (e.g., material error, new data unavailable at review, or failure to meet TOR).

b. Establish explicit triggers for post-STAR technical reconsideration and require that any request to revisit scientific issues be documented and justified against these criteria.

c. Use targeted technical briefings or written responses in lieu of full re-review when clarification is needed after STAR, rather than reopening comprehensive technical discussions in SSC or Council forums.

d. Consider "freeze points" as formal deadlines after which data inputs and model parameters cannot be changed to avoid mid-stream rework that causes delays.

e. Strengthen handoffs between STAR Panels and the SSC by requiring a standardized STAR summary that clearly identifies resolved technical issues, remaining uncertainties, and issues not subject to further technical debate. Standardize documentation and reporting templates across review stages (e.g., STAR, SSC, BSIA briefings) to ensure consistent carry-forward of technical conclusions and reduce repeated explanation.

f. Sequence review stages to avoid any overlap, ensuring that STAR conclusions are finalized before SSC Groundfish Subcommittee and full SSC deliberations begin. Consider combined review tracks for low-controversy stocks or stock complexes.

g. Incorporate minimum buffer periods between review stages (e.g., 2–4 weeks) to allow participants time to absorb findings, reflect on uncertainty, and prepare informed input, particularly for complex or contentious assessments.

h. Limit duplication of reviewer roles across stages, avoiding assignment of the same individuals to STAR Panels and subsequent SSC review for the same assessment cycle unless unavoidable, and clearly defining roles when overlap occurs.

i. Track and periodically evaluate instances of post-STAR technical re-review to assess whether redundancy is occurring and to inform future refinements to scheduling, TOR, and review practices.

4b-iii. Formally **schedule rest periods** for participants between major assessment sessions.

4b-iv. Rotate **review participation** to distribute cognitive load across qualified reviewers.

4c: Stock Assessment Prioritization

Across focus groups, participants agreed that too many stocks compete for too few assessment slots, producing inconsistent timing and, sometimes, unexpected inclusions. Too many stocks compete for limited capacity, often compressing review schedules and reducing opportunities for meaningful revision. Participants reported confusion about how priorities are set and when monitoring-only stocks might be elevated for reassessment. Clear prioritization supports predictable workload management, equitable resource allocation, and transparency about trade-offs. It also creates room for alternative, less resource-intensive assessment approaches (e.g., data-moderate methods, see Subtheme 4d). We acknowledge the TOR addressing stock assessment prioritization, where "Council decisions on groundfish stock assessment priorities are aided by a formulaic approach for ranking groundfish stock assessments developed by the Northwest Fisheries Science Center based on a national framework for stock assessment prioritization described in Methot (2015)... Additionally, the Council decides preliminary priorities for the following groundfish stock assessment cycle (e.g., 2027) to allow agencies more time to prepare for future stock assessments..." (PFMC, 2024; p. 10). By further clarifying rationale and triggers for reassessment, supplementing current

prioritization processes, PFMC can align scientific effort with ecological risk and management needs to ensure science remains both efficient and credible.

Focus group participants commented, *"which species out of all the ones we could possibly assess which ones do get assessed is important."* Council and SSC members both emphasized the importance of transparent criteria and multi-year scheduling. We identify prioritization transparency as a prerequisite for fairness and workload balance. Participants proposed publishing an annual, risk-based prioritization list and linking it to resource planning. Many saw this as an achievable reform that would reduce last-minute shifts and restore predictability for analysts and stakeholders alike. In this context, update assessments were viewed as a deliberate mechanism to support transparency, continuity, and adaptive learning, rather than solely as a capacity-driven compromise. We acknowledge that the frequency of stock assessments is generally aligned with the need to maintain the sustainability of a given fishery, though assessments are often prioritized when approaches used for the previous assessment for a species were inadequate.

Focus group participants emphasized that update and intermediate assessments can serve a strategic role beyond workload management, helping recalibrate expectations, incorporate incremental information, and maintain engagement between benchmark cycles.

Recommended Actions:

4c-i. Publish **annual prioritization lists** with rationale and standardized trigger thresholds for reassessment.

   a. Recognize update and intermediate assessments (such as 'operational updates' for stock with stable models) as strategic components of the assessment portfolio and consider their use to reduce surprise outcomes and sustain confidence in the scientific process.

We acknowledge the existence of the U.S. West Coast Groundfish Assessment Prioritization website and preceding efforts by NMFS staff in comprehensively supporting assessment prioritization (e.g., spearheading approaches suggested by Methot, 2015).

4c-ii. Continue using prioritization lists to **justify alternative, potentially less burdensome assessment approaches** when capacity is limited (see Subtheme 4d below).

4c-iii. Reinforce existing **transparent scoring criteria** that include biological, economic, and data-availability metrics.

4c-iv. Link **prioritization updates** to workload and budget planning cycles (see Recommendation 4a-i above).

4d: Assessment Categorization and Evolution of Approaches

Focus group participants, especially assessment scientists, highlighted a relative stagnancy in the West Coast's benchmark and update assessment methods with only slight modifications to deadlines. One participant questioned "*Is the timeline that we've agreed to reasonable or appropriate for different levels of assessments? That's the question I think we should be posing to*

ourselves. And I'm not sure what the answer is." Respondents noted difficulties in fitting assessments into the current three predetermined categories (i.e., catch-only update, update assessment, and benchmark). There was a call to revisit assessment approaches more generally given constraints in the number of species requiring assessment and management, potentially adapting the Northeast region's research- and management-track model. "*We're doing something similar [to research-track assessments] but on a much more constrained timeline.*" Additionally, the currently agreed upon two-year assessment timeline for different levels of assessments may be problematic, especially for those requiring large structural or data modeling changes.

We emphasize the need to increase flexibility in assessment categories and timelines. We also highlight that reducing long intervals between assessments by increasing use of update or intermediate assessments where appropriate, recognizing that infrequent benchmarks amplify large changes and erode trust.

Relatedly, stakeholders repeatedly highlighted confusion surrounding data-limited and data-moderate terminology, which they believe some interpret as "less scientific." Focus group participants explained, *"People hear 'data-limited' and think it means guesswork."* Assessment scientists countered that these methods are statistically robust and essential for keeping pace with management needs: "*They [stakeholders] question the validity of that method even though the methods have all been vetted in advance.*" Our team encourages reframing them as 'fit-for-purpose science,' and we urge clearer communication about what data are used. Participants endorsed plain-language explanations in technical summaries and public briefings, emphasizing the use of the continuum of assessment methodology. Doing so would preserve efficiency without sacrificing credibility.

We acknowledge that data-limited and data-moderate assessments often carry unintended connotations that these methods are less scientific, creating skepticism among stakeholders. In reality, these approaches are essential for maintaining timely, science-based management within constrained resources. Input by scientists participating in our focus groups indicated that "*In some cases, we were doing data limited assessments simply to get a peek at something that had never been assessed before because we have a throughput problem. We don't have enough stock assessors*."

Miscommunication around terminology, however, can erode confidence in BSIA credibility (see Subtheme 2a) and trigger unnecessary debates about adequacy. Reframing these assessments as robust tools to meet BSIA requirements would justify their analytical legitimacy and value in the broader assessment continuum. Emphasizing transparency in data sources and model rationale helps stakeholders see that rigor and efficiency can coexist.

Recommended Actions:

4d-i. Move away from or adjust categorical assessment labels and emphasize a **continuum of stock assessment methodologies** based on data richness and model complexity, emphasizing that the outcomes would result in management advice consistent with approaches across the spectrum.

a. Inherent in this recommendation is a suggestion to increase flexibility in both assessment categories and associated timelines, acknowledging that the current benchmark/update distinctions and fixed timelines do not always align with assessment complexity or scientific needs.

b. Consider adapting approaches by NOAA's Northeast region leveraging a tiered approach "Management Track" (routine, streamlined updates) vs. "Research Track" (deeper-diving innovation) model for the West Coast.

We acknowledge that the ultimate outcome of assessments is scientific information that informs the setting of an OFL. However, we also recognize that the SSC has a range of options for its BSIA recommendations to the Council (e.g., using assessments to determine status but not set OFLs when the scale of the population is highly unstable, and vice versa). Further emphasizing the legitimacy of the full breadth of stock assessment approaches should focus process participants on the quality of stock assessment outputs (i.e., characterized by their level of uncertainty) rather than on any sort of pre-categorization.

4d-ii. Clearly explain **data usage and rationale** in all technical summaries when reviewing assessments employing these methodologies.

4d-iii. Encourage STATs to continue **employing data-limited/moderate approaches** where viable, with adequate qualification and explanation.

4d-iv. Develop **outreach materials** to help stakeholders understand where and why alternative methods can be applied without substantively impacting quality of outcomes.

Theme 5 — Feedback for Continuous Improvement

Major Theme 5 regards feedback loops. Collaborative governance research emphasizes that effective multi-stakeholder processes rely on reinforcing feedback loops between transparency, participation, and trust. When agencies and community partners share information openly, explain decision rationales, and engage stakeholders meaningfully, they generate early signals of procedural fairness. For example, Ansell and Gash (2008) describe how "small wins" (like joint fact-finding or shared goals) help to build trust over time, creating a virtuous feedback cycle of collaboration. These signals help build baseline trust, which in turn increases stakeholders' willingness to participate constructively, share knowledge, and accept short-term uncertainty. Higher-quality participation then improves the legitimacy and relevance of decisions, producing outcomes that further validate the process and encourage sustained engagement. In this way, collaborative governance systems become self-reinforcing, with each cycle of interaction strengthening the relationships and institutions needed for cooperation.

Conversely, weak communication, opaque decisions, or inconsistent follow-through can generate negative feedback loops. When stakeholders perceive processes as unfair or inaccessible, trust erodes, leading to reduced participation, withholding of local knowledge, and increased conflict. These responses further degrade the quality and perceived legitimacy of decisions, which can trigger additional distrust and disengagement. Social science scholars argue that understanding and intentionally shaping these feedback dynamics is essential for durable collaboration. Well-designed governance arrangements (e.g., those that provide clear roles, joint fact-finding, iterative dialogue, and consistent transparency) can harness positive feedback loops to build cumulative trust, adaptive learning, and shared stewardship over time.

Transparent, timely feedback is the foundation of adaptive governance (c.f., Armitage et al. (2009)). Participants emphasized that PFMC's feedback mechanisms often occur too late (e.g., after STAR panels or Council decisions) leaving little opportunity for course correction. When stakeholders provide input without visible acknowledgment or follow-up, participation becomes transactional rather than collaborative. Scientists likewise reported limited reflection on their own outputs across cycles, with valuable lessons lost between assessment cycles. Feedback that is early, clear, and responsive strengthens trust and demonstrates procedural fairness. It also accelerates organizational learning by capturing insights that inform future assessments. Without these loops, the system risks stagnation and repetition of past challenges, amplifying fatigue and frustration by participants and stakeholders. Here, we offer perspectives and recommendations to support feedback loops relevant to four subthemes.

5a: Transparency Feedback

Participants across nearly all interview sessions emphasized that feedback is often requested too late to influence decisions, creating frustration and skepticism. One focus group participant commented, *"The pre-assessment workshop is too early because we don't have any data… But then by the time you get to the star panel, it's too late. The assessment's already written…"* Scientists likewise said they rarely see how prior review comments shape TOR or assessment adjustments.

We identify the absence of structured feedback loops as a key weakness limiting adaptive learning. Participants urged the Council to demonstrate visibly how input from each cycle informs the next. Iterative check-ins between workshops and STAR panels as well as public summaries of “what changed because of feedback” were widely supported as tangible improvements to rebuild trust.

Recommended Actions:

5a-i. Conduct **iterative feedback check-ins** between data workshops and STAR panels to confirm mutual understanding and identify emerging issues.

5a-ii. Solicit **post-cycle feedback** from all participants (i.e., assessment scientists, SSC, advisory bodies, and stakeholders) within 30 days of each assessment.

5a-iii. Integrate feedback reviews into **hybrid meeting evaluations** to refine facilitation and engagement strategies.

5a-iv. Publicly summarize **feedback themes and resulting process adjustments** to demonstrate transparency and accountability (cross-cutting with recommendations below).

5b: Communication Feedback

The tone and specificity of feedback were described as highly variable and often discouraging. These aspects shape participation quality. Participants across focus groups described instances where feedback felt critical but not constructive, or too general to be useful. Scientists emphasized that non-specific direction from advisory or policy bodies, such as “communicate better,” leaves them uncertain how to improve. Conversely, constructive, targeted communication fosters dialogue and mutual respect. Establishing norms for feedback that emphasize collaboration over critique helps maintain morale, encourages openness to innovation, and strengthens cross-body relationships. The quality of feedback communication determines whether it fuels learning or deepens frustration.

One focus group noted, *“when [the assessment] goes to the Council process and people start ripping, start attacking it, it can get very personal.”* Participants agreed that constructive, actionable communication remains inconsistent across panels, and sometimes, feedback is not specific or relevant enough to enact meaningful change. We call for norms emphasizing respect, clarity, and solution-oriented exchanges with specificity. Participants proposed brief training modules for advisory body chairs and rapporteurs on giving and framing feedback productively. Participants stressed that feedback quality directly influences morale, collaboration, and the willingness to innovate: *"the name of the game is just like trying to make sure people feel engaged and heard."*

Recommended Actions:

5b-i. Develop **feedback guidelines** emphasizing clarity, respect, and solution-oriented language.

5b-ii. Establish **cross-body workshops** between SSC, advisory groups, and staff to exchange constructive feedback and align expectations.

5b-iii. Encourage leadership and meeting chairs to **model constructive communication** practices during reviews.

5b-iv. Recognize **effective feedback examples** in Council briefings to normalize positive reinforcement.

5c: Engagement Feedback

Stakeholders frequently expressed concern that public and workshop input disappears without acknowledgment. Focus groups summarized, *"Fishermen who show up and feel like they might have something to say, but that it never gets heard or really accounted for in a meaningful way. They kind of feel like they get lip service.. from the scientists, but then nothing actually changes."* This lack of closure leaves contributors uncertain whether their perspectives mattered. It was noted that requests are made for an accessible record showing how stakeholder comments are reviewed or acted upon. Participants proposed a publicly available engagement-feedback tracker (similar to an issue log) recording each recommendation and its disposition. Many viewed this as a simple, high-impact reform to make participation feel substantive rather than symbolic.

Stakeholders also frequently expressed that they do not know how their input influences PFMC decisions. Public testimony and workshop contributions often go unacknowledged, leading to "engagement fatigue." When participants perceive that feedback disappears into a void, motivation to engage declines, even among highly invested groups. Providing transparent, traceable responses to public and stakeholder comments closes this loop and validates participation as meaningful. Engagement feedback also helps the Council and SSC identify recurring themes or concerns, allowing for targeted communication and refinement of outreach methods. A visible feedback mechanism would demonstrate accountability and reinforce PFMC's role as a responsive, participatory institution that facilitates bottom-up perspectives.

Recommended Actions:

5c-i. Create a **public engagement feedback tracker**, i.e., an online issue log recording stakeholder recommendations and the Council or SSC's disposition (e.g., accepted, deferred, not adopted, with rationale).

5c-ii. Incorporate **summary responses to public input** in STAR and SSC meeting minutes; allow time for participant/member response to public comment.

5c-iii. Encourage participants to provide **specific, constructive engagement feedback** and set expectations for respectful dialogue.

5c-iv. Include **periodic updates in Council briefings** on how public and advisory input shaped process adjustments.

5d: Assessment Process Feedback

Assessment scientists and reviewers noted that lessons learned during STAR panels are rarely consolidated or applied. One focus group participant emphasized that during every cycle they rediscover the same problems because they don't document what was fixed, or not. The absence of systematic reflection was linked to both process fatigue and turnover, as institutional knowledge dissipates when key individuals depart the process. We recommend formal "post-STAR retrospectives" to capture what worked, what failed, and what should change before the next cycle. Members of the Council family echoed this, emphasizing that feedback mechanisms need to be internalized, not episodic. Participants broadly supported a running feedback archive or spreadsheet accessible to SSC, Council, and NMFS to turn experience into organizational learning.

Within the stock-assessment process itself, feedback is equally vital for continuous improvement and analyst development. Participants noted that STAR and SSC reviews often capture extensive commentary, yet lessons are rarely consolidated or carried into future cycles. Without systematic reflection, recurring issues persist, perpetuating inefficiencies and process fatigue. Institutionalizing structured post-assessment debriefs would ensure that both technical and procedural insights are documented, shared, and applied, which will improve consistency across assessments and enhance mentoring and professional growth. Feedback loops, when formalized and visible, transform participation into a two-way learning exchange; they demonstrate that the Council values input, operationalizes accountability, and converts individual experience into institutional knowledge. From a governance perspective, robust feedback mechanisms sustain procedural justice and transparency to ensure that PFMC decisions remain not only scientifically sound but socially legitimate**.**

Recommended Actions:

5d-i. Develop an **internal feedback archive** or tracking spreadsheet to document recommendations and actions taken across cycles, emphasizing outcoming of existing post-STAR panel retrospectives.

5d-ii. Use retrospective findings to **update TOR guidance and related training materials** annually.

Conclusions

Across all themes and subthemes, participants expressed deep respect for PFMC's scientific rigor and commitment to transparency, while underscoring that the system's strength is also its greatest challenge: complexity. The collective message from the focus groups, interviews, and document review evaluated by the Lynker team is that PFMC's stock assessment review process functions best when communication, education, and engagement are proactive rather than reactive. Participants praised the dedication of NMFS, SSC members, and Council staff, but described a need for clearer pathways, consistent documentation, and structured feedback to transform process compliance into genuine collaboration. Resource constraints, cycle fatigue, and dispersed information access limit the Council's adaptive capacity; however, the Council can mitigate these issues through incremental, coordinated improvements already identified across process participants.

Taken together, the themes point to an assessment review framework that addresses transparency, communication, engagement, cadence, and feedback not as discrete tasks but as reinforcing components of adaptive management. Embedding social-science principles, such as procedural justice, learning theory, and knowledge co-production, will strengthen both the perceived legitimacy and functional efficiency of the stock assessment review system. PFMC's scientific foundation is strong, but its long-term resilience depends on institutionalizing the human systems that connect science, process, and people.

References

Ansell, C., Gash, A. (2008). Collaborative governance in theory and practice. Journal of Public Administration Research and Theory, 18(4), 543–571.

Armitage, D., Berkes, F., Doubleday, N. (eds.) (2009). *Adaptive Co-management: Collaboration, Learning, and Multi-Level Governance.* UBC Press.

Beierle, T. C., Konisky, D. M. (2000). Values, Conflict, and Trust in Participatory Environmental Planning. Journal of Policy Analysis and Management, 19(4), 587–602.

BetterEvaluation. (n.d.). *Rainbow Framework.* Retrieved November 7, 2025, from https://www.betterevaluation.org/frameworks-guides/rainbow-framework.

Cope, J., Dick, E. J., MacCall, A., Monk, M., Soper, B., Wetzel, C. (2015). Data-moderate stock assessments for brown, China, copper, sharpchin, stripetail, and yellowtail rockfishers and English and rex soles in 2013. NOAA Fisheries Northwest Fisheries Science Center and Southwest Fisheries Science Center.

Emerson, K., Nabatchi, T. (2015). Collaborative Governance Regimes. Washington, DC: Georgetown University Press.

Hartley, T., Robertson, R. (2009). Stakeholder Collaboration in Fisheries Research: Integrating Knowledge Among Fishing Leaders and Science Partners in Northern New England. *Society and Natural Resources*, *22*, 42–55.

Lind, E. A., Tyler, T. R. (1988). The Social Psychology of Procedural Justice. New York, NY: Plenum Press.

McQuail, D. (2010) McQuail's Mass Communication Theory. Sage Publications.

Mendoza, G. A.; Prabhu, R. (2006). Participatory modeling and analysis for sustainable forest management: Overview of soft system dynamics models and applications. *Forest Policy and Economics*. *9*(2): 179–196. doi:10.1016/j.forpol.2005.06.006.

Methot Jr., R. D. (2015). Prioritizing fish stock assessments. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/SPO- 152, 31 p.

Nadon, M. O., Oshima, M. C., Bohaboy, E. C., Carvalho, F. (2023). *Stock assessment of American Samoa bottomfish, 2023*. NOAA Fisheries Pacific Islands Fisheries Science Center. https://doi.org//10.25923/0sd4-9a69.

National Marine Fisheries Service (NMFS). (2019). West Coast Best Scientific Information Available (BSIA) Regional Framework."

Rowe, G., Frewer, L. J. (2000). *Public participation methods: A framework for evaluation.* Science, Technology, & Human Values, 25(1), 3–29.

Silas, M. O., Semba, M. L., Mgeleka, S. S., Van Well, L., Linderholm, H. W., Gullström, M. (2023). Using fishers' local ecological knowledge for management of small-scale fisheries in

data-poor regions: comparing seasonal interview and field observation records in East Africa. *Fisheries Research*, *264*. 106721. https://doi.org/10.1016/j.fishres.2023.106721.

United Nations Development Group. (2017). *UNDAF companion guidance: Theory of change (UNDG–UNDAF companion pieces No.7)*.https://unsdg.un.org/sites/default/files/UNDG-UNDAF-Companion-Pieces-7-Theory-of-Change.pdf

Additional References Reviewed

Argyris, C., Schön, D. (1978). *Organizational learning: A theory of action perspective.* Reading, MA: Addison-Wesley.

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners, 35*(4), 216–224.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, NJ: Prentice-Hall.

Becker, H. S. (1963). *Outsiders: Studies in the sociology of deviance.* New York, NY: Free Press.

Berkson, J. (2025). *Recommendations for improving the PFMC STAR Panel cadence.* Lynker Corporation.

Biddle, B. J. (1986). Recent developments in role theory. *Annual Review of Sociology, 12*, 67–92.

Cash, D. W., Clark, W. C., Alcock, F., Dickson, N. M., Eckley, N., Guston, D. H., Jäger, J., Mitchell, R. B. (2003). Knowledge systems for sustainable development. *Proceedings of the National Academy of Sciences, 100*(14), 8086–8091. https://doi.org/10.1073/pnas.1231332100.

Crosson, S. (2013). The impact of empowering scientific advisory committees to constrain catch limits in US fisheries. *Science and Public Policy, 40*(2), 261–273. https://doi.org/10.1093/scipol/scs104.

Demerouti, E., Bakker, A. B., Nachreiner, F., Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology, 86*(3), 499–512.

Dick, E. J., MacCall, A. D. (2010). Estimates of Sustainable Yield for 50 Data-Poor Stocks in the Pacific Coast Groundfish Fishery Management Plan. (NOAA Technical Memorandum NMFS-SWFSC-460)

Dorval, E. (2025). *Process improvement recommendations for the PFMC stock assessment review process.* Lynker Corporation..

Eagle, J., Newkirk, S., Thompson, B. H. Jr. (2003). *Taking stock of the regional fishery management councils*. Island Press.

Edmondson, A. C. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly, 44*(2), 350–383.

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication, 43*(4), 51–58.

Ferrero, R. C. (Chair). (2014). *Chair's summary report of the NWFSC Science Program Review of the California Current Groundfish Stock Assessment Process*. Northwest Fisheries Science Center.

Fox, J. (2007). The uncertain relationship between transparency and accountability. *Development in Practice, 17*(4–5), 663–671.

Gieryn, T. F. (1983). Boundary-work and the demarcation of science from non-science: Strains and interests in professional ideologies of scientists. *American Sociological Review, 48*(6), 781–795.

Guston, D. H. (2001). Boundary organizations in environmental policy and science: An introduction. *Science, Technology, & Human Values, 26*(4), 399–408.

Hilborn, R. (n.d.). *Comments on the quillback rockfish assessment* [Conference presentation slides]. School of Aquatic and Fishery Sciences, University of Washington.

Holling, C. S. (1978). *Adaptive environmental assessment and management.* Chichester: John Wiley & Sons.

Honadle, B. W. (1981). A capacity-building framework: A search for concept and purpose. *Public Administration Review, 41*(5), 575–580.

Hood, C. (2006). Transparency in historical perspective. In C. Hood, D. Heald (Eds.), *Transparency: The key to better governance?* (pp. 3–23). Oxford: Oxford University Press.

Jasanoff, S. (2004). *States of knowledge: The co-production of science and the social order.* London: Routledge.

Kahn, R. L., Wolfe, D. M., Quinn, R. P., Snoek, J. D., Rosenthal, R. A. (1964). *Organizational stress: Studies in role conflict and ambiguity.* New York, NY: Wiley.

Kilarski, S. (2025, September). *SSC Groundfish Subcommittee Meeting Notes.* Lynker Corporation.

Knowles, M. S. (1984). *The adult learner: A neglected species* (3rd ed.). Houston, TX: Gulf Publishing.

Levi, M. (1998). *Consent, dissent, and patriotism.* Cambridge: Cambridge University Press.

London, M. (2003). *Job feedback: Giving, seeking, and using feedback for performance improvement.* Mahwah, NJ: Lawrence Erlbaum Associates.

Lynch, P. D., Methot, R. D., Link, J. S. (Eds.). (2018). *Implementing a next generation stock assessment enterprise: An update to the NOAA Fisheries Stock Assessment Improvement Plan* (NOAA Technical Memorandum NMFS-F/SPO-183).

Mayne, J. (2017). Theory of change analysis: Building robust theories of change. *Canadian Journal of Program Evaluation, 32*(1), 155–173.

Morgan, P. (2006). *The concept of capacity.* Maastricht: European Centre for Development Policy Management.

National Marine Fisheries Service (NMFS). (2021). *A review of reviews: Lessons learned from comprehensive program reviews across the NOAA Fisheries science enterprise* (NOAA Technical Memorandum NMFS-F/SPO-216).

NMFS. (2019). *West Coast Best Scientific Information Available (BSIA) Regional Framework*.

Nonaka, I., Takeuchi, H. (1995). *The knowledge-creating company.* New York, NY: Oxford University Press.

Northwest Fisheries Science Center (NWFSC). (2014). *Stock Assessment Science Program Review: NWFSC summary and response*.

NWFSC. (2024). *Analysis of assessment capacity and target frequencies for conducting West Coast groundfish assessments* (Agenda Item F.3.a, NWFSC Report 1). Pacific Fishery Management Council.

Pacific Fishery Management Council (PFMC). (2024). *Terms of reference for the groundfish stock assessment review process for 2025–2026.Pacific Fishery Management Council*. Portland, Oregon. *59 p.*

PFMC. (2025). *Briefing book: Open comment letter on Science Center capacity loss.* Portland, OR.

PFMC. (2025). *Request for proposals: Evaluation of the PFMC stock assessment review process.* Portland, OR.

PFMC. (2025). Report of the Pre-Assessment Workshop for the 2025 Groundfish Stock Assessment of Sablefish and Rougheye/Blackspotted Rockfish Portland, OR.

Punt, A. E., Tuck, G. N., Day, J., Canales, C. M., Cope, J. M., de Moor, C. L., De Oliveira, J. A. A., Dickey-Collas, M., Elvarsson, B. Þ., Haltuch, M. A., Hamel, O. S., Hicks, A. C., Legault, C. M., Lynch, P. D., Wilberg, M. J. (2020). When are model-based stock assessments rejected for use in management and what happens then? *Fisheries Research, 224*, 105465. https://doi.org/10.1016/j.fishres.2019.105465.

Putnam, R. D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy, 6*(1), 65–78.

Remington, T. (2025, November). *SSC Meeting Notes*. Lynker Corporation.

Remington, T., Kilarski, S. (2025). *1-on-1 Interview with Merrick Burden: Notes on PFMC Review Process.* Lynker Corporation.

Remington, T., Kilarski, S. (2025). *PFMC stock assessment review process evaluation notes: Focus Groups A–J.* Lynker Corporation.

Remington, T., Kilarski, S. (2025). *Stock Assessment Review Process Evaluation: Meeting Notes.* Lynker Corporation.

Risley, S. C., Britsch, M. L., Stoll, J. S., Leslie, H.M. (2025). Mapping local knowledge supports science and stewardship. *Ambio*., *54*(10):1648-1665. doi: 10.1007/s13280-025-02170-4.

Satterthwaite, W. H. (2023). The reproducibility crisis meets stock assessment science: Sources of inadvertent bias in the stock assessment prioritization and review process. *Fisheries Research, 266*, 106763. https://doi.org/10.1016/j.fishres.2023.106763.

Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization.* New York, NY: Doubleday.

Short, J., Williams, E., Christie, B. (1976). *The social psychology of telecommunications.* London: Wiley.

Shertzer, K. W., Prager, M. H. (2007). Delay in fishery management: Diminished yield, longer rebuilding, and increased probability of stock collapse. *ICES Journal of Marine Science, 64*(1), 149–159. https://doi.org/10.1093/icesjms/fsl005.

Southwest Fisheries Science Center (SWFSC). (2014). *Stock Assessment Science Program Review: SWFSC summary and response*.

Simon, H. A. (1957). *Models of man: Social and rational.* New York, NY: Wiley.

Slovic, P. (1987). Perception of risk. *Science, 236*(4799), 280–285.

Spitzberg, B. H., Cupach, W. R. (1984). *Interpersonal communication competence.* Beverly Hills, CA: Sage.

Terceiro, M. (2018). The summer flounder chronicles III: Struggling with success, 2011–2016. *Reviews in Fish Biology and Fisheries, 28*, 381–404. https://doi.org/10.1007/s11160-017-9506-x.

Tyler, T. R. (1990). *Why people obey the law.* New Haven, CT: Yale University Press.

Van Maanen, J., Schein, E. H. (1979). Toward a theory of organizational socialization. *Research in Organizational Behavior, 1*, 209–264.

Walker, B., Holling, C. S., Carpenter, S. R., Kinzig, A. (2004). Resilience, adaptability and transformability in social–ecological systems. *Ecology and Society, 9*(2), 5.

Weick, K. E. (1995). *Sensemaking in organizations.* Thousand Oaks, CA: Sage.

Weiss, C. H. (1995). Nothing as practical as good theory: Exploring theory-based evaluation for comprehensive community initiatives for children and families. In J. Connell, A. Kubisch, L. Schorr, C. Weiss (Eds.), *New approaches to evaluating community initiatives* (pp. 65–92). Washington, DC: Aspen Institute.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity.* Cambridge: Cambridge University Press.

Wetzel, C. R., Punt, A. E. (2011). Performance of a fisheries catch-at-age model (Stock Synthesis) in data-limited situations. *Marine and Freshwater Research, 62*(8), 927–936. https://doi.org/10.1071/MF11006.

Wilson, T. D. (1999). Models in information behaviour research. *Journal of Documentation, 55*(3), 249–270.

Appendix A — Semi-Structured Interview Guide

Semi-Structured Interview Instrument

PFMC Stock Assessment Review and Adoption Process Evaluation

V.2 May 23, 2025

General Instrument

Overview: The Pacific Fishery Management Council (PFMC), along with the Northwest and Southwest Fisheries Science Centers, are reflecting upon the West Coast's stock assessment system. The Council's assessment review and adoption process has served it well for many years. However, new pressures, changing financial and personnel resources, recent changes in beliefs, attitudes, and perspectives, and continued evolution in public process best practices warrants a review of how the current Council's stock assessment review and adoption process is structured.

This semi-structured interview (SSI) form contains 35 questions across seven themes designed to provide important information regarding key stakeholders' perspectives about the PFMC's stock assessment review and adoption process. The SSI technique gives structure to an interview via a written question guide. It is a low cost, common method for rapidly gathering data from small groups or individuals, and allows the interview to be conversational, while keeping it focused, and it encourages the interviewee to determine relevant details that they wish to share on the subject matter.

Lynker Team Interviewer instructions:

1. Please inform the respondent that:
    - Their responses are confidential. We will develop our write-up in such a way that their responses will not be able to be associated with their name or role. We will not share our raw notes with anyone outside of our consulting team.
    - This interview is voluntary and will take between 30-60 minutes.
    - We greatly appreciate their time.
2. The questions below are a guide. You may frame them in your own voice, but please do not alter the *substance* of the question. If an answer to a previous question indicates that you do not need to ask a subsequent question, you may skip the question, but please capture that in your interview notes. If the respondent approves, we ask that you record the interview.
3. An introductory script will accompany this SSI to describe the purpose of this project (an investigation of the stock assessment peer review process and how that process tees up decision making by various Council groups and the Council itself). It will include mention of the Terms of Reference for Groundfish stock assessment.

Evaluation Drivers as Elucidated in the Scope of Work

For internal review use only. This will not be provided to interviewees.

- There has been a notable and concerning change in perceptions of the assessment

process, at least for a portion of the participants in the Council process.

- There is concern that federal budget pressures will challenge the capacity to maintain the process as is.
- The assessments conducted in 2023 resulted in reduced ACLs for a number of stocks with negative consequences to both commercial and recreational fisheries.
- The 2023 cycle also further evaluated data limited assessments conducted in 2021 that showed low abundance for rockfish stocks in some areas of the coast. This was counter to the trend seen over the previous 4 cycles where assessments showed improved stock condition, including successful rebuilding of several rockfish species.
- The lower estimates of stock status were unexpected also in that the Council consistently maintained catch below scientifically recommended harvest specs.
- The discussions that followed the 2023 assessments were marked by higher levels of tension among stakeholders, scientists, Council advisors, and the Council itself. The experience has led some long-time participants in the process to be concerned over:
    - a loss of cohesive dialog among multiple members of the Council process
    - a lack of buy-in to assessment results by some stakeholders, and
    - a perceived inequity in decision-making that threatens the stability and efficacy of the Council's assessment and management system.
- Several hypotheses have arisen that attempt to explain the increased tension mentioned above. These include:
    - A loss of "face time" and open dialog between stakeholders, the SSC, assessment scientists, and NMFS leadership as a result of the COVID pandemic.
    - Reduced budgets for travel and meeting participation.
    - A belief by some that the manner in which data limited assessments are reviewed and acted upon has deviated from expectations and long running practice.
- Negative assessment results that lead to negative economic consequences receive more scrutiny than those that are positive or neutral in their effects.
- It is unclear whether some of the challenges described above are the result of shortcomings in the present process—either in its design or execution, a symptom of the unexpected assessment outcomes, or a combination of the two.
- We are effectively investigating the peer review process and how that process tees up decision making by various Council groups and the Council itself.
- Questions should dig deep into core elements of rigorous peer review.
- Elements necessary for a "good" peer review process:
    - Fairness and objectivity
    - Reviewer selection (expertise, experience, bias)
    - Process steps (timeliness, clarity/rigidity of rules/TOR)
    - Feedback (development of recommendations/how recommendations are taken)
    - Transparency
    - Feedback loops for continued improvement

Interview Themes/Questions

Theme 1: Participation Background and History

T1Q1. What is/was your role in regional stock assessment? For example, perhaps you are a scientist who helps develop them, or maybe you have a role in their review or approving their adoption.

T1Q2. How long have you been/were involved in the activities you described in the preceding question?

T1Q3. How well do you feel you understand the entirety of the regional stock assessment review and adoption process, including the Terms of Reference for Groundfish stock assessment? Could you give a high level overview of the process and your role in two or three sentences?

Theme 2: Changes Over Time

*T2Q1. From your perspective, have there been any noteworthy changes in recent years in terms of any **communications elements** of the regional stock assessment review and adoption process? This could include, for example, structured opportunities for formal or informal dialogue between key participants and/or stakeholders. If yes, please tell me more.*

T2Q2. In discussions with your colleagues or other stakeholders in recent years, has anyone mentioned any noteworthy changes regarding any other important aspect/core element of the regional stock assessment review and adoption process? Especially changes that have concerned them. If yes, please tell me more.

T2Q3. Have you observed any changes in recent years to the levels of ease and comfort with which stakeholders, including scientists, Council advisors, and the Council members engage with each other when it comes to meetings and discussions regarding draft assessment results and the process to review and adopt those draft results? In other words, has the process become more contentious in recent years? If yes, please tell me more.

T2Q4. Do you believe that budget realities have negatively impacted regional stock assessment review and adoption process-related travel and meeting participation in recent years? If yes, please tell me more.

T2Q5. From your perspective, have there been any noteworthy changes to any other important aspect/core element of the process of assessing regional stocks in recent years not covered by the last several questions? If yes, please tell me more.

Theme 3: Assessment Validity

T3Q1. Given your background and familiarity with the regional stock assessment review and adoption process, have any recent assessment results been significantly counter to what you had expected?

T3Q2. If you answered the previous question in the affirmative, could you describe why you think this may have happened?

T3Q3. If you were dissatisfied with the final result of a stock assessment, do you feel that the stock assessment review and adoption process in general has an adequate mechanism for disputing and/or resolving the situation, such as built in opportunities to challenge and then discuss assumptions and process elements?

T3Q4. If you answered "no" to the previous question, do you feel that such a mechanism is feasible to build into the regional stock assessment review and adoption process setting?

Theme 4: General Stock Assessment Review and Adoption Process

T4Q1. Above, I asked you how well do you feel you understand the entirety of the regional stock assessment review and adoption process as it currently exists. Now I'd like ask for your perspective on how the Council could improve the following key process elements:

- *Timeliness*
- *Clarity of the TOR*
- *Rigidity of rules*
- *Others*

T4Q2. Would you say that any important groups are under-represented, or not represented at all, in the regional stock assessment review and adoption process?

T4Q3. Have you had any significant concerns with the accuracy of any important information used in any regional stock assessment determination?

T4Q4. Previously, I asked about the potential to appeal the final result of a stock assessment. To your understanding, is the regional stock assessment review and adoption process designed so that decisions made at key points in the process can be modified or reversed before moving to the next step?

T4Q5. Do you believe the regional stock assessment review and adoption process has been generally consistent across time, regardless of the exact mix of people involved?

T4Q6. Have you observed any difference between how data limited vs. data rich assessments are reviewed and acted upon in recent years?

Theme 5: Peer Review Process Design

In these next several questions, I'd like to dig a little deeper into the design of the peer review process. These questions are related to those immediately above, but have a somewhat different focus.

T5Q1. To your knowledge, is there a formal process to select people who will be involved with reviewing and adopting each stock assessment?

T5Q2. [Depending on the answer to the previous question] Do you feel that this process is purposefully designed to ensure those individuals:

- *Have the necessary subject matter expertise?*
- *Have the necessary regional experience?*
- *Are known to be an objective reviewer?*

T5Q3. Do you feel that the peer review process, as designed and implemented, adequately ensures that scientists, managers, and others' personal self-interests or narrow preconceptions are suppressed?

T5Q4. How transparent do you think all steps in the peer review process are for each of the following groups?

- *Scientists*
- *Managers*
- *Fishing public*
- *Non-fishing public*

T5Q5. To your knowledge, does the peer review process (as currently conducted) include any formal feedback loops to facilitate continuous improvement (for example, an "after action review")?

T5Q6. Given your background and familiarity with the regional stock assessment review and adoption process, have any of the core elements of recent assessment peer reviews been less rigorous/poorly implemented in comparison to what you have been conditioned to expect?

Theme 6: Public Engagement

T6Q1. How easy is it for the general public to find information regarding: data, data limitations, stock assessment reports, process steps, and the stock assessment review and adoption process?

T6Q2. In your opinion, to what extent do managers and scientists value the general (non-fishing) public's interest and input regarding regional stock assessments and the assessment review and adoption process?

T6Q3. In your opinion, to what extent do managers and scientists value the fishing public's interest and input regarding regional stock assessments and the stock assessment review and adoption process?

T6Q4. What steps, if any, might the Council take to improve the ability of the fishing and non-fishing public to understand and participate in the regional stock assessment review and adoption process?

T6Q5. Do you have any recommendations for changes to the regional stock assessment review and adoption process to better facilitate and foster public engagement in it?

T6Q6. Do you feel any relevant group is currently functionally excluded from discussion and consideration of the regional stock assessments and the assessment review and adoption process?

Theme 7: The Future

T7Q1. Are you concerned that current or future federal budgets will impact the ability of Council and NMFS staff to participate in and maintain a robust, trusted regional stock assessment review and adoption process?

T7Q2. Do any of the things we've discussed today concern you regarding ensuring the right people are willing to fully and enthusiastically participate in future regional stock assessment review and adoption processes?

T7Q3. Do any of the things we've discussed today concern you regarding broad trust in the adoption (results) of future stock assessments?

T7Q4. If you indicated previously that you feel there are groups that are underrepresented in the regional stock assessment review and adoption processes, do you have any suggestions for getting these groups more involved?

T7Q5. Is there anything else you'd like to discuss regarding any aspect of the regional stock assessment process or the process to review and adopt them?

Surprise Questions

SQ1. If you could wave a magic wand and implement any change to the stock assessment review process with no limitations associated with resources, timing, or capacity, what would you change?

SQ2. Is there anything we missed that you would like to express?

Appendix B — Example Template for BSIA Briefing

Best Scientific Information Available (BSIA) Briefing

Stock / Assessment:
Assessment Type: (Benchmark / Update / Other)
Presenter/Collaborators:
Council Meeting:
Date:

1. What Question Does This Assessment Answer? *(In plain language, i.e., what managers are being informed about)*

- Current stock status relative to reference points;
- Recent trends (increasing, stable, declining); and
- Key biological or fishery drivers influencing results.

2. Why This Assessment Meets BSIA Standards *(What "BSIA" means in this case, i.e., not a claim of certainty)*

For example, "This assessment represents Best Scientific Information Available because it:

- Uses the best data currently available for this stock;
- Applies peer-reviewed methods consistent with Council Terms of Reference;
- Has been independently reviewed through the STAR Panel and SSC; and
- Transparently documents assumptions, data gaps, and uncertainty."

Important clarification:
Emphasize that BSIA does not mean the assessment is free of uncertainty or that additional data would not improve future assessments.

3. What Has Changed Since the Last Assessment? *(Only material changes, avoiding extraneous technical detail, explaining why results may differ from previous assessments)*

- New or updated data sources;
- Changes in model structure or assumptions; and
- Time elapsed since last benchmark (if relevant).

4. Key Sources of Uncertainty and Why They Exist *(Explain uncertainty, not defending it, while noting these uncertainties are explicitly incorporated into the assessment, not ignored.)*

For example, major sources of uncertainty could include:

- Limited or variable survey data or data streams;
- Long intervals between benchmark assessments;
- Biological variability in growth, recruitment, or mortality; and/or
- Fishery behavior or spatial changes.

5. What This Assessment Does Not Tell Us *(Set boundaries to avoid over-interpretation)*

For example, "This assessment:

- Does not predict short-term fishery performance with precision;
- Does not eliminate the need for management judgment; and
- Does not imply fault in past management actions."

6. How Uncertainty Relates to Management Risk *(Conceptual, not prescriptive)*

For example, express that:

- Higher uncertainty generally increases management risk;
- Risk is managed through buffers, harvest control rules, and Council decisions (describe application both within the assessment model and subsequently, e.g., through P* processes); and
- Different management choices reflect different risk tolerances, not different science.

7. Key Takeaway for the Council and Stakeholders *(One clear sentence)*

For example, "This assessment provides the best available scientific basis for decision-making at this time, clearly describes its uncertainty, and supports informed management choices under the MSA."

Appendix C — Example Implementation for the PFMC Advisory Body Bootcamp

PFMC Advisory Body Bootcamp Implementation Plan

By building a shared procedural foundation, the bootcamp supports scientific rigor, trust, transparency, and effective engagement without altering PFMC authority or scientific standards.

Recommended Structure

Frequency, Timing, and Duration

- Annual offering: one session and optional refresher modules available on demand.
- Shorter targeted refreshers: offered when major process changes occur (e.g., revised TOR).
- Core bootcamp: 1 day total, split into modules.
- Each module: 60–90 minutes, allowing flexible participation.

Format

- Live hybrid sessions with recorded modules for asynchronous viewing.
- To include interactive elements:
    - Process walk-throughs,
    - Scenario-based exercises, and
    - Q&A with panelists.

Delivery and Facilitation

- Co-facilitators to include:
    - Council staff: governance, process, timelines
    - Science Center staff (as available): assessment flow and review boundaries
    - SSC members (rotating): perspective on scientific review
    - Experienced advisory body members (rotating): practical insights

Participant Expectations

- Strongly encouraged for:
    - New advisory body members
    - New Council members
- Recommended refresher every 3–4 years for returning members
- Not mandatory or exclusionary

Core Curriculum Modules

<u>Module 1: PFMC Governance, Roles, and Decision Authority</u>

- Objective: Clarify who does what, and who does not, in the PFMC process.
- Content:
    - Council authority vs. advisory roles
    - Legal framework (MSA, National Standards)

    - Roles of Council members, Advisory Subpanels, Management Teams, the SSC, and NMFS Science Centers and Regional Offices
    - How advice flows to decisions
- Outcome: Participants understand the limits and influence of advisory input, reducing role confusion.

Module 2: Stock Assessment Lifecycle and Review Flow

- Objective: Build shared understanding of how assessments are developed, reviewed, and adopted.
- Content:
    - Description of assessment planning and scoping
    - Description of data compilation and modeling phases
    - STAR panels and TOR expectations
    - SSC review and Council use of assessments
    - Where uncertainty enters the process
- Outcome: Participants know when and how engagement is most effective.

Module 3: Engagement Pathways and Effective Participation

- Objective: Improve the quality and usefulness of advisory input.
- Content:
    - Formal engagement points (workshops, public comment, advisory body deliberations)
    - What constitutes effective advice at different stages
    - Distinction between:
        - Technical critique
        - Policy preferences
        - Observational knowledge
    - Best practices for framing concerns and recommendations
- Outcome: More targeted, timely, and constructive advisory input.

Module 4: Data, Knowledge, and BSIA

- Objective: Clarify how different types of information are evaluated and used.
- Content:
    - BSIA principles and limitations
    - Treatment of LEK and cooperative research data
    - What “considered” vs. “used” means in practice
    - Relationship between data submissions, assessment development, and review
- Outcome: Reduced frustration over data use and clearer expectations.

Module 5: Advisory Responsibilities and Professional Norms

- Objective: Reinforce expectations for conduct and collaboration.
- Content:
    - Advisory body responsibilities and ethics

    - Managing disagreement productively
    - Working within time and process constraints
    - Respectful communication in high-stakes settings
- Outcome: Improved meeting dynamics and trust.

Additional Notes

- Content should be reviewed annually for accuracy and relevance
- To remain feasible under budget constraints:
    - Leverage existing materials and staff expertise
    - Record once, reuse across cycles
    - Pilot with one fishery
    - Combine with existing orientation efforts as reasonable
- The Advisory Body Bootcamp directly responds to:
    - Loss of institutional memory
    - Increased tension during assessment and management cycles
    - Misaligned expectations about roles and influence
    - Stakeholder frustration with opaque processes.

Appendix D — Example Data-Use Memo (for use in tandem with early Data Workshops)

PFMC Stock Assessment Data-Use Memo

Stock(s):
Assessment Cycle:
Science Center:
Assessment Scientist(s):
Date:

1. Purpose and Scope

This memo documents how external data inputs and information, including local ecological knowledge (LEK), cooperative research data, and other non-standard datasets, were considered during the development of the stock assessment for the above-referenced stock(s).

This memo is intended to:

- Enhance transparency;
- Clarify data evaluation and use; and
- Support understanding of assessment development decisions.

This memo does not constitute peer review findings and does not replace STAR panel evaluations.

2. Summary of External Inputs Considered

Input Source	Data Type	Time Period	Intended Application
Example: Commercial fishers	LEK (distribution shifts)	2015–2024	Spatial structure, diagnostics
Example: Cooperative survey	Fishery-dependent index	2018–2023	Abundance index

3. Data-Use Determinations

Each external input was evaluated using criteria consistent with BSIA, TOR guidance, and assessment design constraints.

Input Source	Determination	Application (if any)
Example: LEK observations	Conditionally incorporated	Used to inform sensitivity analyses
Example: Cooperative survey	Deferred	Insufficient temporal coverage

Determination categories:

- Incorporated;
- Conditionally Incorporated;
- Deferred; or
- Out of Scope.

4. Rationale for Determinations

For each input, the rationale for its determination is summarized below.

Input #1:
Determination:
Rationale:

Input #2:
Determination:
Rationale:
(Note: Include technical considerations such as data quality, spatial/temporal alignment, uncertainty, consistency with assessment framework, and TOR constraints here.)

5. How External Inputs Informed Assessment Development

This section summarizes how external inputs influenced:

- Model structure or assumptions (if applicable);
- Selection of diagnostics or sensitivity analyses; and
- Interpretation of assessment results.

Where inputs were not incorporated, this section clarifies whether they:

- Informed qualitative understanding;
- Suggested future research needs; and
- Highlighted potential mismatches between data streams.

6. Deferred Inputs and Pathways for Future Use

For inputs not used in this assessment cycle, the following conditions may enable future consideration:

- Additional data collection or documentation;
- Methodological refinement; and
- Alignment with future assessment timelines.

This section is intended to clarify that deferral does not imply dismissal.

7. Relationship to STAR Panel Review

This memo:

- Is provided for informational purposes;
- Does not alter STAR panel review criteria; and
- Does not substitute for independent peer review findings.

8. Acknowledgements

We acknowledge the contributions of stakeholders, cooperative research partners, and other data providers whose inputs were considered during assessment development.

Appendix E – Crosswalk of Recommendations to Reference Documents and Focus Group Discussions

Table E1. Crosswalk of Recommendations to Reference Documents and Focus Group Discussion

Recommendations by Theme	**Crosswalk**		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
Transparency			
1a-i. Create plain-language visual maps of the full assessment cycle.	"Understanding the process is maybe challenging... it's not in a comprehensive document explained well..." Focus Group F "It is complicated, but where the Council can make things a little more digestible... I was first starting to try and do things, I'd come and say hey I want to do this or I need to understand that, and they're like, 'oh, that was three meetings ago,' and I'd show up the next year at that meeting. They're like, 'oh, no, that only happens on odd year'...having something like that would relieve so much frustration of guys coming, taking time off the water, coming testifying or calling in only to be told, 'this isn't the the right meeting for that,' or 'you're too late.' That is like incredibly infuriating for folks." Focus Group I "It is nearly impossible for somebody who's not engaged to really navigate the process." Focus Group I "Process steps could be better explained… infographics, just some flowcharts would go a long way." Focus Group F	The TOR state that a goal and objective of the groundfish STAR process is to: "*...increase understanding and acceptance of stock assessments and peer reviews by all members of the Council family...*" (p. 10). The TOR state that "*The STAR is by design a transparent process. STAR panel meetings are open to the public and are announced on the Council's website, through Council meeting notices, and in the Federal Register prior to the STAR panel meeting*" (p. 12). Timelines in the TOR are sometimes integrated within narrative text, making them more involved to identify, e.g., "*Assessments... should be substantively complete... by the November briefing book deadline to facilitate a final SSC review in November*" (p. 14).	Case study from other region(s) - the development of visual maps drawn from recent assessment improvement processes undertaking by the PIFSC FRMD Stock Assessment Program (pers. comm., M. Sabater, 2025) helped rebuild trust with fishing communities after a poorly received assessment.

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
.	“So there's always going to be a fundamental challenge about the actual science of stock assessment, and then being anyone else who's engaged in the process who doesn't have that training expertise to understand that and and that is what it is." Focus Group B "...a place where the public can go to see this is the entire process. These are the points along the way that I can really have some engagement." Focus Group D "Something I'm working on right now with staff for MREP is creating a visual like graphic type document that's linear that shows the assessment cycle for the FMPs." Focus Group I		
1a-ii. Continue and improve clarity of one-page assessment summaries.	"..at the Sablefish STAR panel... we saw a mockup of these handouts that are basically intended for the one page front and back, to really synthesize the information from a single assessment, which is really awesome to see." Focus Group D "Communication around what has changed or for each assessment can be improved and our assessment group has tried to make that more clear with one-page summaries" Focus Group D (also relevant for recommendations under Theme 5)	The NMFS Process Review Suggestions on the 2025 Assessment Cycle (2026) stated "*While we are glad that the two-page 'at-a-glance' summaries were well-received, we note that they are a product to communicate with managers, industry, and other stakeholders, not for scientific review.*"	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	"There's usually at least a few folks in our mix there would attend an evening session where they would disseminate the information from the stock assessments to the council members...and that's sort of I think what these one pagers are going or really two pagers are meant to help distill on paper as well." Focus Group F "The NWFSC is implementing these infographic sheets that are one-pagers that are trying to improve the communication of key points." Focus Group F "We were trying to build these kind of little two-page summaries. We call them at a glance things. Again, another communication tool that's that is kind of part of the review still. I mean I think it wears lots of different hats, but one of them is to engage people that don't understand population dynamics." Focus Group F		
1a-iii. Simplify TOR introductions and clarify when and how they are developed.	"The TOR can be difficult… to digest, let alone expect the public to be able to sift through to understand everything... all the guidance its giving." Focus Group D	The TOR themselves do not precisely indicate where or at what cadence they are updated beyond acknowledgement that "*the SSC... is responsible for* developing *the Terms of* Reference" (p. 28).	At the Sept. 2025 Groundfish Subcommittee meeting: Comments acknowledged various portals (e.g., SAFE, groundfish), reports, scorecards, databases (e.g., for specifications).

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	A participant explained that a complete misunderstanding of these terms can lead to significant objections during assessments, highlighting the need for someone on the panel to ensure adherence to the established process and prevent reviewers from imposing their own assessment preferences. Focus Group C "It took me approximately four cycles, or eight years, to gain a decent understanding of the assessment process, review, adoption, and particularly the Terms of Reference (TOR)... I wasn't sure exactly when or how to provide input on that or when it changes" Focus Group I “I wasn't sure exactly when or how to provide input [on the TOR] or when it changes…” Focus Group I		
1a-iv. Publish “How to Engage” guide, specifying when and how stakeholders and the public will be engaged.	"And so I do think there are a number of ...public ... and and tribal members that are not able to participate in the process just because it just seems too complicated or there's not clear pathways for them to participate and that is a challenge." Focus Group E ..when does the public weigh in? How do they get to weigh in? What does it mean for the stock assessment? ...what does it mean for the entire STAR process and the entire management cycle that goes along with this two-year groundish cycle? And I think that	The TOR state they were revised " *to outline specific opportunities for discussion of GMT and GAP concerns during STAR panel reviews*, " and our recommendation encompasses these details be provided for other process participants. The TOR states that "*The STAR panel, STATs, the GMT and GAP representatives, and the public are all legitimate meeting participants*	At the June 2025 Chilipepper and Quillback Rockfish STAR panel: ● As the STAR Panel progressed past Day 2, it became more and more difficult for online attendees to understand or follow ongoing discussion between the Panel and the STAT, likely for two main reasons: a) Panel members do not adequately identify themself when asking question to a STAT or reacting to a response from the STAT (see Recommendation 1c-ii below); b) scheduling exact time for STAT to provide their responses to the Panel became more

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	can be really frustrating for stakeholders because they don't know when to weigh in and they don't know exactly where to weigh in and they're not sure..what piece of information is valuable when and where...whether it be for stock assessors or maybe it's for council members or maybe it's for GMT members... maybe it's for all of the above... how do they bring their expertise and knowledge to the table in the right time in the right way for the right decision point and don't consistently feel like they are being shoved aside or not heard." Focus Group B There's a gap in outreach materials regarding the entire process and how it works from start to finish and what points the public has an opportunity to engage..." Focus Group D "One of the problems is, where do Council members and the public weigh in on a STAR process? I think everybody thought, 'well, we need to go to STAR panel,' but the STAR panel is way too late." Focus Group B "...maybe the process itself needs to be improved in a way so that stakeholders don't have to know, 'okay, these are the the five touch points I need to be engaged in and the 15 people I need to be sure I talk to and I need to be at this advisory body then and on the council floor here.'" Focus Group B	*who should be accommodated in discussions*" (p. 12).	and more difficult as the meeting progressed (hence making it more difficult for the public online to keep following the process actively).

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
1 a-v. Develop and maintain audience-specific communication tools that explicitly support the non-fishing community.	“Thinking as the fishing and non-fishing public... our process is probably a black box if you don't know it already...” Focus Group E "It's hard to understand... and it's not clear whose job it is to do that communication... we can't take time in the review process to help educate people." Focus Group E “... the point of a STAR panel is not necessarily to… explain it to the general public...” Focus Group A Focus Group C stated that the process is opaque to the non-fishing public and those outside the industry or management processes. They also noted that there is a relatively low value on input from the non-fishing public, as that input has historically focused on assessment results and interpretations rather than the processes itself.		
1b-i. Centralize records on a single online portal.	"We've been making things publicly available earlier in the process. So, there used to be an FTP site where they would post certain things, you know, now we're putting up pre-STAR assessment documents. We're putting up post-STAR reports. We're making things available to the process earlier than we did before." Focus Group A “...data is sort of scattered everywhere.” Focus Group I	The SWFSC Response to the 2014 Assessment Program review recommended to "*provide a one-stop-shop for stock assessment information on the Center’s website.*"	At the Sept. 2025 Groundfish Subcommittee meeting: the project team noted reference several various portals, report documents, scorecards, and databases. At the June 2025 Chilipepper and Quillback Rockfish STAR panel: ● All pre-STAR documents (including drafts of both stock assessments) were shared via the PAM website. Sharing documents via this platform allows easy access to the

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	"...it's challenging to find information about the stock assessment review and adoption process." Focus Group I "I actually looked at that on the Council website and yeah, they have their process spelled out, but it's horrible. I mean, it's just like link to tons of text, link to tons of text, link." - Focus Group F “There's various places that you can decipher what the process is… but there isn’t a single place… to see the entire process.” Focus Group D		public to all assessment documents prior to the STAR panel. This is a major improvement to past practices, when pre-assessment documents were shared via a ftp site with limited access to the general public. Our recommendation builds on this progress.
1b-ii. Standardize metadata and file naming conventions.			Project team perspective: this would be implemented in concert with the online portal (see recommendation 1b-i) to facilitate searchability and file identification; this is common practice for digital organization.
1b-iii. Maintain current contact lists with quarterly updates.	"...coming into this, you don't know what the GAP is... putting that roster directly in with the Groundfish FMP stuff, like 'here are your representatives,; just explicitly, even through it may be duplicative... just having it in one place." Focus Group I		Case study from other region(s) - the project team has personal experience trying to identify process participants and advisory body members for other Councils with partial success. There are instances where lists are not updated with regularity, resulting in inaccurate rosters for various groups.
1b-iv. Provide documents embedded within the Council’s summary of agenda items.			SSC Chair, Jason Schffler, suggested this at the November 2025 SSC meeting.

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
1c-i. Continue employing hybrid meeting formats that combine remote accessibility with in-person interaction.	“...we've definitely had an increase in our public comments at SSC meetings as a result of the meeting being virtual...” Focus Group E “Now you can be involved from anywhere, so that helps… it's just opening the door for anybody in process.” Focus Group F “...there's an opportunity to incorporate some sort of a hybrid process to let folks join that can't or haven't been able to.” Focus Group I "...for this cycle, we're also just seeing limited opportunities due to funding for in-person face communications. And I'm a little nervous to see how that will go and how just discussion around the assessments will transpire." Focus Group D "...it's easier for people to participate remotely." Focus Group J "webinars have really increased our amount of communication in terms of communication to stakeholders and managers" Focus Group A "During the pre-assessment workshops... there were two different sets of stakeholders who called in from on the water while they were fishing to participate." Focus Group F	The NWFSC Response to the 2014 Assessment Program Review recommended to "*prioritize, when practical, opportunities for face-to-face meetings and venues that encourage increased collaborations.*"	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
1c-ii. Develop virtual facilitation protocols and rules.			Observations at PFMC meeting, STAR Panel, and SSC meetings included: ● comments from online participants in chat feature ● online speakers not identifying themselves which can make discussion difficult to follow (additionally, no roll call) ● conversation via chat ● questions in the middle of presentations ● figures would benefit from increased font size and general readability to enhance collective understanding. As seen in advisory body meetings for the WPFMC, a more regimented meeting protocol could be appropriate (e.g., raise hands to speak, identify self when speaking, no conversation via chat).
1c-iii. Train chairs and moderators in online deliberation/ facilitation techniques.	"...the quality of those interactions has become poorer because it's online. It's harder to interact with people." Focus Group J	The TOR state that "*it is the STAR panel chair's responsibility to ensure that... the meeting is run effectively and efficiently. The STAR panel Chair should also provide an overview of the meeting expectations to ensure respectful interactions among STAR participants throughout the meeting. This avoids discussing topics beyond the scope of the assessment review to focus efforts on the task at hand*" (p. 18).	At November 2025 SSC meeting, the project team observed: ● questions interjected in the middle of many presentations ● frequent use of acronyms, technical terms, and slang that are usually not defined (also at Yellowtail STAR meeting), sometimes confusing to SSC members themselves (e.g., at Sept. 2025 GFSC meeting). ● large amount of time spent on items such as assigning rapporteurs At several PFMC and STAR panels the project

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
			team observed meeting members talking over one another. At September 2025 SSC meeting: There was some confusion who was leading meeting, resulting in some strange dynamics (though we are unclear why Chair wasn't perceived as acting in this role).
1c-iv. Improve and standardize technical capacity for virtual meetings to minimize issues and interruptions during discussion.			At the Nov. 2025 SSC meeting: The project team technical issues (e.g., internet connectivity, difficulties hearing remote participants) that impacted discussion. At September 2025 GFSC meeting, the project team observed: ● Audio not functional at times, emphasizing limitations to remote participation options. ● Discussion on issues with meeting links, logistics, and calendar invitations.
Communication			
2a-i. Standardize the expression of uncertainty, brief risk summaries, and intuitive definitions of misunderstood terms, etc	"...the way uncertainty is portrayed in a stock assessment... and the ability to communicate that... we continually struggle at the Council to fully uncertainty the uncertainty." Focus Group E “If we don't communicate, characterize, understand uncertainty, we're… adding risk that's not really accounted for in our process.” Focus Group E	MSA paragraph (a)(6)(iv) Transparency and openness: *"(A) The Magnuson-Stevens Act provides broad public and stakeholder access to the fishery conservation and management process, including access to the scientific information upon which the process and management measures are based. Public comment should be solicited at appropriate times during the*	Although much effort has been done to improve communicating “Uncertainty” to various components of the PFMC review process, the process will likely remain contentious/controversial if alternative methods are not used to reinforce understanding of uncertainty and its consequence to the livelihood of fishing communities in general. One alternative would be to associate assessment model outcomes with direct cost/benefit analyses for both

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	"I think we need to do better at communicating [the nature of uncertainty]. - Focus Group F "...without improving the communication of the uncertainty… we are going to get blamed for not having good data." Focus Group F "...we can work together to both communicate that uncertainty to the public and the stakeholders and improve the process so that we don't have those huge swings." Focus Group F "We have this P* approaches... and I don't know that people understand that... our sigma is pretty big." - Focus Group B "And we can present information about uncertainty, but it's not always very clear how to incorporate that into management." Focus Group J Jason Cope (1-on-1) emphasized the need to effectively convey assessment results, uncertainties, and changes to stakeholders in a way that fosters understanding and trust, allowing discussions to focus on management decisions rather than questioning the scientific process	*review of scientific information. Communication with the public should be structured to foster understanding of the scientific process.*" MSA paragraph (a)(6)(iv) Transparency and openness: "*(B) Scientific information products should describe data collection methods, report sources of uncertainty or statistical error, and acknowledge other data limitations.* Such products should explain any decisions to exclude data from analysis. Scientific products should identify major assumptions and uncertainties of analytical models. Finally, such products should openly acknowledge gaps in scientific information." The TORs state that "to best serve their purpose, stock assessments must attempt to identify and quantify major uncertainties, balance realism and parsimony, and make best use of the available data" (p. 7). The TORs state that "confidence intervals for model outputs, as well as other measures of uncertainty	optimistic and pessimistic results. It would much easier for stakeholders to buy in the process, if they have a better tool to assess the tradeoff between short-term/long-term gain and the sustainability of a fishery based on each assessment outcomes. Project Team Observations

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
		that could affect management decisions, should be provided in completed stock assessments and the reports prepared by STAR panels" (p. 15), however we emphasize that the manner in which this is done is also important for collective understanding. The TORs state that "*while the basis for the decision tables... should be determined at the STAR panel,...*" and "*there are several ways in which the probabilities can be assigned to each model [in a two-way decision table]*" (p. 15), suggesting the non-standardized approach to populating the tables. The TORs present technical terms such as "*lnR0*" without definition (p. 15).	
2a-ii. Include brief, intuitive definitions of technical terms in public reports.	"...it may be still a problem of communication in terms of how to explain the complexity of the the stock assessment framework." Focus Group E		

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
2a-iii. Adopt plain-language pre-briefings deliberations relevant to assessment outputs.	"...when we get big changes, usually it's because the last assessment said the future is very uncertain, and then the next time you do an assessment, you get a different answer." Focus Group F "...the Canary Rockfish assessment from last cycle, the results from that assessment were very surprising to many people... I think still communication around what has changed or for each assessment can be improved..." Focus Group D	MSA paragraph (a)(6)(iv) Transparency and openness: "*(B) Scientific information products should describe data collection methods, report sources of uncertainty or statistical error, and acknowledge other data limitations. Such products should explain any decisions to exclude data from analysis. Scientific products should identify major assumptions and uncertainties of analytical models. Finally, such products should openly acknowledge gaps in scientific information.*"	At Yellowtail Rockfish STAR panel, attending project team member noted that plain language summaries of analysis methods and assessment outputs would benefit consistent understanding.
2a-iv. Provide optional communication training modules for new participants.	"...we could have a council staff member that is essentially kind of like a stock assessment coordinator and and helping people like figure out the process who are not familiar." Focus Group E "I didn't get the impression that people were chomping at the bit to get in that room and give their views and their information to scientists. Now, that can be for several reasons, right? It can be either because they don't have much to say or it could be because they are demoralized and don't feel like it will be received" Focus Group H Participant in Focus Group E proposed an online training resource for the Pacific Council region, accessible to states and		

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	fishermen, to explain core processes.		
2b-i. Include dedicated “BSIA Briefings” during Council meetings, using concise, plain-language.	"...emphasize the importance of a robust review process to identify when a stock assessment should not be accepted, suggesting that the current 'best science' test might be insufficient and proposing a two-phase question: 'Is this the best science?' and 'Is it adequate?'" Focus Group J "It is challenging I think for the council when this SSC comes in and goes this is BSIA as like a stock assessment. It is very hard to counter that argument even if there are rational things that the GAP and GMT and the public are saying that they're like this does not make sense." Focus Group A	From the West Coast BSIA Regional Framework: "*NS2 Guidelines lists seven criteria for evaluating BSIA: relevance, inclusivity, objectivity, transparency and openness, timeliness, verification and validation, and peer review... it is helpful for the SSCs to include an* acknowledgement *that they consider their recommendations to be based on BSIA.*"	A fundamentally-important question is when is the science strong enough to be classified as BSIA. That is currently the purview of the SSC, though it can be challenging for them to draw that line. There isn’t a lot of clear guidance, even from a national NMFS level, on what constitutes adequacy for BSIA purposes. Expert feedback (Hastie).
2b-ii. Establish a technical referral protocol that allows the Council to request the SSC to reevaluate determinations when new information arises.	"...we need to find some process... where we can say, pause... this doesn't make sense." Focus Group I "We're led to believe [the Council doesn't] have the discretion to disagree with the SSC... pressed the pause button a bit on Quillback, but [the Council's] hand was forced." Focus Group B "The Council did ask the SSC to go back and look at some things that were raised by stakeholders and there was another meetingmeeitng... I don't feel like the SSC responded to the express request of the council to take another look at things" Focus Group B	From the West Coast BSIA Regional Framework: "*Resolution of BSIA disagreements between the PFMC, its SSC, and NMFS will emphasize the importance of timely, joint efforts and collaborative efforts to resolve the issue where possible and by building from the positive working relationships enjoyed by NMFS and PFMC.*" The TORs state "*Assessment results from model runs that are technically flawed or questionable on other grounds should be identified by the panel and excluded from the alternatives upon which*	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	"...we could have suspended that [assessment] and waited and done the assessment the next time around and got more information, but they went ahead and shoved it through. But basically weren't open to revisiting to the depth that you think you would want to give members of the coastal community... people went out of business." Focus Group B "...if there is available some kind of like emergency button that people on the stakeholder side can push to indicate that they're either sort of freaked out by or really not seeing eye to eye with a scientific product..." Focus Group H	*management advice is to be developed*" (p. 15). The TORs state "*the GMT chair should communicate any unresolved issues to the SSC for consideration*" (p. 27).	
2b-ii. Host cross-body workshops to align expectations and understanding.	"And I think the why things have changed is, one of the big reasons we have maybe a little bit more controversy recently than we have in the past is because things have changed between assessments." Focus Group E "I did a pre-review discussion, so this was even before the STAR panel. We held a meeting as part of one of these regular scheduled data and assessment large discussion outreach kind of events, and that was actually fairly well attended. So, that was another way to kind of get some review feedback, even though it was actually before the formal review." Focus Group E		Project team observation synthesis indicated potential value in holding regular SSC-STAR-Council meetings, even just one day before relevant Council meetings to ease disconnects between groups.

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
2c-i. Develop recurring “Advisory Body Bootcamp” programs	"...then, as managers, both the GMT and the Council's really important role is to simply understand the level of uncertainty and risk that is associated with an assessment to then inform how precautionary to be when we're setting management measures later on." Focus Group D "...once the the assessments are deemed BSIA, what does the Council and the management and advisory bodies do with that information and translate that into management action?" Focus Group E "...people [advisory body members] didn't really have their legs under them to really think of what needed to be changed or how to change it or 'is it appropriate for me to suggest change in the first place? Who am I to suggest that kind of thing?'" Focus Group I "...it can be a little intimidating if you're not the stock assessment scientist to be asking questions virtually and express that vulnerability of trying to just understand and get clarification on things." Focus Group D (Note relevancy for recommendation 2c-iv below).		Project team observation synthesis: The process can take up to four cycles for industry representatives to understand. Given representative turnover, a more efficient "on-ramp" may be beneficial.

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
2c-ii. Rotate advisory body alumni as informal mentors for new members.	"He [Pete Libig (sp?)] was there for the very first Council meeting. I don't think he missed one groundfish meeting in 37 years, and he was the groundish advisory subpanel chair for a number of years, Council member, and he went to well over a hundred STAR panels I'd imagine... [if] there was an ongoing discussion, people had questions, they had someone they could call up and ask a question, 'hey what is this, why am I seeing this, is there some information here, can you help me out ,what nets do I use,' or whatever, they had a go-to person. " Focus Group B		Similar observation as recommendation 2c-i above. With the high turnover rate among advisory panel members, we note there is a need for mechanisms to help new members understand the process more quickly. At September 2025 GFSC meeting: ● New member was the focus of perhaps overly particular criticism regarding accuracy of wording used in discussion.
2c-iii. Encourage Council staff to host periodic “office hours.”	"I used to work for the conservation community and I recall trying to learn about the groundish process then and essentially being told it wasn't my business and that I couldn't get any help from Council staff to understand what was happening. But council staff now it seems like they take their mission to work with stakeholders more seriously." Focus Group B "We could have a Council staff member that is essentially kind of like a stock assessment coordinator and helping people figure out the process who are not familiar." Focus Group D		Many participants noted the value in Jason Cope's monthly meeting, which is open to all stakeholders and where anyone can ask a question. Similar to these monthly meetings, there may be utility in open "office hours" to provide the space for stakeholders to ask questions, learn from, and engage with Council staff.

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
2c-iv. Develop a concise Advisory Body Handbook.	"... more clear guidance on advisory body engagements in the STAR panels whereas before those were not as articulated." Focus Group D "... the TOR can be difficult for even managers on the GMT..." Focus Group D "...maybe it's for GMT members... how do they bring their expertise and knowledge to the table in the right time in the right way for the right decision point and don't consistently feel like they are being shoved aside or not heard." Focus Group B		This would be directly related to recommendation 2c-i as associated documentation.
Stakeholder Engagement			
3a-i. Prioritize two-tiered, early data workshops preceding assessment cycles.	“Frustration arises when assessments are presented at the very end of the process, with little opportunity for earlier engagement.” Focus Group E "There's the data prep and inclusion and selection component, and then there's the model implementation. And I think maybe separating some of the process could be beneficial because there's a lot of focus on the data, and rightly so, in the current STAR panel review, but it's very compressed and short and everybody's focused on getting through the review and getting the model out the end." Focus Group J "I've... seen increased attendance at	The 2025-2026 TORs were revised "*to encourage more involvement in data-related conversations among assessment process participants earlier in the process, including more engagement in pre-assessment workshops and daily discussions between STAR panel chair and GMT, GAP representatives during the panel review.*" The TORs state that "*to best serve their purpose, stock assessments must attempt to identify and quantify major uncertainties, balance realism and parsimony, and make best use of the available data*"	Pre-assessment workshops should be extended… allowing fishermen… to provide inputs during data and model review… not only during sporadic comment periods. At Nov. 2025 SSC meeting: ● Jeff Lackey expressed that there is "incompatibility *of the model [for widow rockfish] and what's going on in the ocean...*" ● Sarah Nayani stated "*what we're looking at here... an assessment that doesn't have a lot of information* reflecting *what we're seeing on the water.*" ● Nayani also said "*Fishermen's perspectives can be valuable to*

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	pre-assessment data workshops which were kind of voluntary and ambiguous and now are much more accepted and expected." Focus Group D "We started realizing like the states were like, 'hey, we're doing all these efforts to do like these data reconstructions, and maybe there's other data sources out there that we'd hear about from industry or like the states,' but there was never a process to really get to that unless you were talking directly to the STAT." Focus Group A "I think the last cycle is the first time we've started to see pre-assessment data workshops... before the assessments are fully developed. So that's an opportunity for outreach and transparency." Focus Group B "...by the time you get to the STAR panel, all the data is fixed." Focus Group J Focus Group participants generally indicated a need for: 1) earlier entry points (before modeling); and 2) follow-up touch-points (after initial vetting, before finalization).	(p. 7). The NMFS Process Review Suggestions on the 2025 Assessment Cycle (2026) stated that "*During this past cycle, the fishing community again expressed a strong desire to have their perspectives incorporated. The data workshops are one opportunity for this, and we are also open to other ways to continue to improve participation and engagement*."	*assessments when we're missing data like this… scientists need more collaboration with the industry.*" ● Mike Rutherford said "*[Fishermen have] valuable insight, but it doesn't feel like it's being used very well.*" At the May 2025 Yellowtail Rockfish STAR panel: ● there was a suggestion in chat that "*the CPUE is not good without context... fishermen could help provide that context...*"

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
3a-ii. Develop “data-use memos” showing how inputs were applied (see Appendix D).	“...it's surprising how many issues the panel reviews throw up about data choices... there were clear questions about data choices in the 2025 Quillback assessment…” Focus Group J “Fishermen feel their input is often unheard or not accounted for in a meaningful way…” Focus Group H (Note connection with recommendation 3a-i above).	MSA paragraph (a)(6)(iv) Transparency and openness: "*(B) Scientific information products should describe data collection methods, report sources of uncertainty or statistical error, and acknowledge other data limitations. Such products should explain any decisions to exclude data from analysis. Scientific products should identify major assumptions and uncertainties of analytical models. Finally, such products should openly acknowledge gaps in scientific information.*"	
3a-iii. Offer training in interpreting and incorporating LEK.	Focus Group E participant observed a trending decline in broad trust and emphasized the need to incentivize earlier integration of local ecological knowledge into the scientific process to ensure people feel heard before final decisions are made "We know that [the fish] are out there and then you get an assessment that shows something completely different" 1-on-1 Interview “It is just really hard to… bridge the gap between anecdotal observations… and a statistical model.” Focus Group H "What the STAR panels are, basically folks are pretty much set on what the world view is,	The TORs state that "*Council staff will also provide STATs with tables of fishery regulatory history and time series of harvest management specifications...This should include the major management measures that are likely to have impacted selectivity or retention parameters to inform time blocking within the assessment. Documentation of regulatory histories for stock assessments by Council staff will be developed in consultation with the states and the GMT*" (p. 25) and "*a GMT representative... attends the STAR panel meeting and serves as an advisor to the STAT and STAR panel on changes in fishing*	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	and now we're just looking at any if there's something glaring, a technical thing that stands out. As opposed to information feeding into that. So I think during outreach time, there's just been a concern, a misunderstanding maybe across the board even with the stock assessment folks about how to accept that input and how early to accept that. I just know that years ago there used to be a lot more outreach than we have had the last two or three cycles." Focus Group B "These are in cases some cases guys have had decades of experience on the grounds and with certain species that could hopefully be of value." Focus Group D	*regulations that may influence data used in the assessment and the nature of the fishery in the future*" (p. 26). However, we note that LEK can provide valuable information apart from regulatory histories that can help inform assessment time blocking and qualify data. The NOAA OST Implementing a Next Generation Stock Assessment Enterprise document (2018) states "*when LEK is voluntarily provided and helps support one or more steps of the scientific process, it may also be considered citizen science. NOAA Fisheries will continue to explore and identify further opportunities to increase the application of citizen science and LEK in stock assessment efforts around the country*" (p. 86).	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
3a-iv. Encourage NMFS to cultivate cooperative data collection and/or research programs for groundfish fisheries.	Participants repeatedly pointed to cooperative data collection efforts as successful and worth expanding, particularly given resource constraints. "...as we navigate through the constraints of financial and and uh more responsibilities to our scientists, we're going to need to rely on citizen science more and more." Focus Group I “Industry has increasingly stepped up… collaborating… on cooperative research and data collection…” Focus Group I “Groundfish cooperative data collection… over 40 vessels contributing… demonstrating success of collaborative relationships.” Focus Group F "...it's been described as a citizen science opportunity of volunteer anglers going out and collecting data in a kind of a scientifically designed way. And that has been helpful." Focus Group D "There's also cooperative research that is being done. There's a cooperative research program through NOAA and sampling is being done. Melissa Monk did a lot for the most recent Quillback rockfish assessment in the last two years." Focus Group D	The West Coast BSIA Regional Framework does not explicitly identify industry as an outside entity that collaborates to produce scientific information. However, the TORs do identify "*interested persons*" (p. 6) as a "*[party] involved in the process...*". The TORs state that "*to best serve their purpose, stock assessments must attempt to identify and quantify major uncertainties, balance realism and parsimony, and make best use of the available data*" (p. 7). The TORs state that "*Most stock assessments rely on data collected by state agencies and Tribal staff as part of their routine fishery monitoring and sampling activities... some data from special collections may only be available directly from the state agencies or Tribes and may require special considerations (e.g., because of unusual sampling protocols). State and Tribal data stewards or other* knowledgeable representatives *from the state agencies and Tribes should work with the STATs to provide relevant stock assessment data*" (p. 27).	Citizen science programs… could be used as input into stock assessments. At Nov. 2025 SSC meeting: ● Sarah Nayani stated "*...have a* survey *that doesn't sample* areas *where rockfish are, and catch data from two areas that aren't primary to the fishery.*" ● Nayani also offered that "*With all of the federal cuts... want to find pathways to have vessels already fishing to provide data to support questions that advisory bodies are asking.*" ● Mike Rutherford noted that "*Fishermen on the water are your best avenue for near real time data*." At the May 2025 Yellowtail Rockfish STAR panel: ● there was a suggestion in chat to ask fishermen "*to submit much more detailed* information *of their midwater trawls so unites on effort versus catch rate can be observed* alongside *more detailed weather information*" (unknown source) At the June 2025 Chilipepper and Quillback Rockfish STAR panel: ● Industry members voiced support for the ROV survey conducted by CDFW, but did not believe that Farrallon Bottom Trawl Survey Data are

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
		The NOAA OST Implementing a Next Generation Stock Assessment Enterprise document (2018) states "*citizen science offers a cost-effective approach to help address data needs. It also helps build trust and relationships with core stakeholder groups through their involvement in the scientific process*" (p. 86).	representative of the spatial distribution of the stock (i.e., lack of survey data representativeness).
3b-i. Continue (and increase) investment in pre-assessment workshops.	"Expand pre-assessment workshops to all assessment types… to allow crucial fisherman input earlier." Focus Group I "We structure a pre-assessment workshop for a different kind of communication and a different kind of dialogue to occur. The type of communication and dialogue that's occurring in a STAR panel is is very different." Focus Group A "I do think... that solved a lot... is those preassessment workshops... We would get to STAR panels and it was, 'you were missing X data stream, Y data stream, why did you do this, the fleet are all wrong, what's happening?' As opposed to the STAT teams having to go off and completely change so much in the model, I think they're coming in with a stronger base model that requires less tinkering with it." Focus Group A	The 2025-2026 TORs were revised "to encourage more involvement in data-related conversations among assessment process participants earlier in the process, including more engagement in pre-assessment workshops and daily discussions between STAR panel chair and GMT, GAP representatives during the panel review." The TORs state "*participation in the pre-assessment workshop is expected to provide input on direction of the assessment early in the process and to be aware of all issues raised*", and "the STAR panel chair should prepare a report detailing issues raised at the pre-assessment workshop and ensure that any issues raised at the pre-assessment workshop are	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	"We started doing these one-day workshops at the Council office and... we would talk through every single assessment in one day, and it was like, 'here are all these data streams. Are we missing anything? does this seem odd?'... now we have full day pre-assessment workshops that are remote to allow for public comment" Focus Group A "There's a preassessment workshop as well, which is a fairly new thing that gives the opportunity for advisory bodies and the public to see sort of what data sources are being used what the stock assessor's plan is and get any initial feedback." Focus Group B "...you're always trying to balance the cost and time and money of having multiple preassessment workshops *in situ* to provide more one-on-one participation." Focus Group J "We've really leaned in pretty heavily on the pre-assessment workshops where before those were held a little bit more infrequently and were sometimes in person, so less accessible. Are we where we want to be in terms of participation? No, probably not. Not yet. But it is growing." Focus Group E	adequately addressed. The STAR panel Chair should document modeling decisions agreed at pre-assessment workshop... via the pre-assessment meeting workshop report..." (p. 19). The TORs state "*Council staff are also responsible for disseminating information about pre-assessment workshops to facilitate stakeholder engagement early in the stock assessment process*" (p. 25), though this is the extent of Council staff support for these engagement opportunities. Additional specificity surrounding what dissemination entails could be beneficial. The TORs state "*GMT participation in the pre-assessment workshop is expected to provide input on direction of the assessment early in the process*" (p. 26), and "*[GAP] participation in planning the pre-assessment workshop is expected to facilitate stakeholder engagement and provide input on directions of the assessment early in the process*" (p. 27). The NMFS Process Review Suggestions on the 2025 Assessment Cycle (2026) stated	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
		that "*...there was an increase in the voices heard during the pre-assessment data workshops. During this past cycle, the fishing community again expressed a strong desire to have their perspectives incorporated. The data workshops are one opportunity for this, and we are also open to other ways to continue to improve participation and engagement.*"	
3b-ii. Encourage additional engagement points for stakeholders with the STAT.	"Maybe there's other data sources out there that we'd hear about from industry or the states, but there was never a process to really get to that unless you were talking directly to the STAT team." Focus Group A "...during the last few years, there's been a ton of turnover... staff turnover, the assessment scientist turnover, new assessment scientists coming in who... didn't .. for two years have the ability to make any... personal interactions with...any stakeholders... I think it's kind of eroded a lot of the relationships that maybe had been built with some of the assessment scientists who are around for a long time who we used to see regularly at the meetings." Focus Group I "... it is really hard to find folks in the industry who are willing to sit through those really	The TORs do not describe engagement points for stakeholders with the STAT but state "*STATs should make themselves available for discussions and meetings with industry and interested parties to discuss data and stock assessment issues as needed*" (p. 23).	At the May 2025 Yellowtail Rockfish STAR panel: • public comment came after requests from STAR Panel to STAT were addressed.

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	complex scientific panels and digest all that information when they could otherwise be out fishing, making money." Focus Group D Participants noted there has been noticeable decline in direct and informal interaction with STAT, reducing opportunities for clarification, trust-building, and iterative discussion.		
3b-iii. Partner with the Marine Resource Education Program (MREP) or similar programs to adapt early learning modules for stakeholder audiences.	"...programs like MREP ... that education tool is really important, but that's a small program. So how do we do that but on a bigger scale is a challenging question." Focus Group E "I went to MREP in 2019 or 2020 right before COVID with the intent of getting into the Council or GAP or something like that and getting way more hands-on with the process." Focus Group I	The SWFSC Response to the 2014 Assessment Program review recommended to "*establish a series of workshops..., participate in public fisheries events, and/or host regular "open houses" at PFMC meetings for targeted audiences...*"	
3c-i. Institutionalize education sessions (e.g., MREP).	"I think programs like MREP... that education tool is really important, but that's a small program. So, how do we do that but on a bigger scale is a challenging question." Focus Group E Participant in Focus Group E highlighted the success of informal monthly virtual calls, initiated in fall 2021, which have increased direct engagement and questions from stakeholders and industry members	The SWFSC Response to the 2014 Assessment Program review recommended to "*establish a series of workshops..., participate in public fisheries events, and/or host regular "open houses" at PFMC meetings for targeted audiences...*"	Nearly every focus group participant has praised… monthly education sessions
3c-ii. Standardize "Data Workshop Packets"	"it's surprising how many issues the panel reviews throw up about data choices... there		

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
summarizing data and decisions.	were clear questions about data choices in the 2025 Quillback assessment…" Focus Group J		
3c-iii. Develop educational videos or briefing papers.	"'At a glance summaries… engage people unfamiliar…" Focus Group E "There is a need to "create more digestible materials… linear graphic documents…" Focus Group I		
Assessment Process Cadence			
4a-i. Further integrate workload planning processes.	"Staffing reductions have limited the number of assessments that can be conducted, leading to longer periods between assessments…" Focus Group C "Diminishing capacity on the NMFS side is making traditional constructs... there's a need to revamp those tools." Focus Group A "There's a letter in our June briefing book... explicitly discusses the capacity loss as well as potential implications to... things NMFS does to support the process" Focus Group A "...funding and support for assessment staffing would go a long way for for us. I mean, part of the reason that we can't do assessments so frequently, I mean, a lot of that is just because we don't we have too many stocks to cover and not enough assessment scientists." Focus Group E		

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
4a-ii. Streamline review layers and reduce redundancy.	Participants highlighted the resource-intensive and often repetitive nature of the current stock assessment review process, involving STAR panels, the Groundfish Subcommittee, and the SSC. "Updates and data moderate assessments bypass STAR panels for resource reasons… which raises questions about redundancy when SSC members are also on STAR panels." 1-on-1 interview		At September 2025 GFSC meeting: • Observed repetition of information and data results to different audiences. Consider ways to make this more efficient / less repetitive
4a-iii. Request multi-year/rotating funding structures.	"Budgetary issues… are likely to negatively affect the quality, number, and outcome of assessments in the future." Focus Group J "Reduced funding for travel… has negatively impacted the process by limiting in-person participation of staff teams." Focus Group C		
4a-iv. Expand scientist cross training.	"State agencies on the West Coast have been hemorrhaging fishery people for a long time. I mean, they've been flat budgeted since the '90s, you could argue. And it used to be that you had, you know, very experienced scientists in Washington Fish and Wildlife and Oregon Fish and Wildlife and California Fish and Wildlife who knew um who knew a lot about a lot a lot of the species that we managed like very deep expertise and they would participate in these processes and sometimes do the assessments or contribute to the assessments and comment on the assessments." 1-on-1 interview	The SWFSC Response to the 2014 Assessment Program review recommended to "*increase the number and availability of qualified scientists capable of leading stock assessments*" (p. 13).	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
4b-i. Rebalance workload through a three-stage STAR process.	STAR panels can require “overnight work from lead authors,” which is “unsustainable and potentially error-prone.” Focus Group J "...there's a week, so we have a couple days to get through 400 pages of documents and check theTOR, get feedback back, compile that between [Council staff[and the STAR panel chair, and get it to the STAT. The STAT needs to make changes and address those that feedback to get another version by the following Monday. So we literally do that in a week and and that's a very tight timeline but it does ensure that like the the version that goes out for public review and for the STAR panel review has had that preliminary checks. And then after the assessment, and the panel, we also have another check to make sure that everything's aligned and right with the TOR before that goes forward for review by the GFSC and the full SSC and the Council." Focus Group A "...it was really hard for the STAT teams to get through a panel. And I feel like I've been hearing in recent years that the STATs have been really appreciative of the panels just checking with them and being very realistic about what is manageable to do over the course of a week and over the course of a night, so that there's time for them to come back." Focus Group A "The STAR panel process is pretty	The TORs state "requests for large changes in data or analytical methods used may often require a significant amount of time to complete and may result in changes to the assessment that cannot be adequately evaluated during the course of the STAR panel meeting" (p. 13-14), emphasizing the constraints that the limited timeframe places on producing a product on which all agree. These issues are otherwise relegated to mop-up meetings or future assessments. The TORs state "*to the extent possible, analyses requested by the STAR panel should be completed by the STAT during the STAR panel meeting...If follow-up work by the STAT is required after the review meeting..., this should be completed before the briefing book deadline for the Council meeting at which the assessment is scheduled for review*" (p. 14), also emphasizing the rapid pace at which requests must be addressed by the STAT in concert with the ongoing STAR panel. The TORs state that "*historically MCMC [Markov Chain Monte Carlo methods] has been challenging for*	At Nov. 2025 SSC meeting: ● SSC member Cheryl Barnes said: "*...the method of review [for widow rockfish] is less than ideal because everyone is beyond capacity. It may make sense to adjust timelines and decisions in the future.*" At the June 2025 Chilipepper and Quillback Rockfish STAR panel: ● Panel requests were generally fair and balanced, and gave the STATs sufficient time to address their requests throughout the review. Our recommendation emphasizes continuing this trend. As the Panel progressed, scheduling exact time for STAT to provide their responses to the Panel became more and more difficult. The process of Requests, Rationale, Response, and Conclusion is very effective at data checking and model confirmation/parameter selections. STAT and Panel work as a check and balance to confirm accuracy and justify assumptions in data sources/modeling to reach reliable and vetted stock assessment. additional time would reinforce this dynamic and further reduce errors associated with late-night work and time crunches. Specifically for sablefish, there were concerns that the Panel expressed that could not be addressed in a single week, resulting in the SSC taking on the burden of connecting dots

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	complicated as an author because you present all day and then go home and work all night and by Friday people are exhausted or sick and have the potential to make errors by the end of the week. So some I would change so that's not the case." Focus Group J Authors should have “more time between meetings,” rather than a condensed five-day review. Focus Group J "...change the STAR panel process, noting that the demand for overnight work from lead authors is unsustainable and potentially error-prone, despite its value as a public process." Focus Group J "...my secret wish would be to have enough time to like have this step of the review process and this step of the process and everything laid out sort of sequentially in a way where we're not just struggling with all of this crazy overlap and trying to keep track of, you know, trying to keep track of all the different people and where you at, where you're at with all the different review timelines happening for all the different assessments and the different panels and the different council meetings and and all the different people." Focus Group A	*West Coast groundfish stock assessments due to long run times and the STAR panel process that requires sub-daily turnaround of exploratory model results*" (p.16). The TORs state that "*in some cases, STAR panel members may have fundamental disagreements among themselves that cannot be resolved during the review meeting*" (p. 17). The SWFSC Response to the 2014 Assessment Program review recommended to "*modify the current stock assessment review process to ensure that time needed to foster careful and thoughtful completion of the assessment is available.*" The NMFS Process Review Suggestions on the 2025 Assessment Cycle (2026) stated "*Reviewing update assessments within a single-day GFSC meeting does not seem to provide sufficient time to address even minor issues found during review.*"	between two models. ● Data scarcity exacerbates all issues

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
4b-ii. Limit redundant review steps.	"We spend a lot of time reviewing and adopting our TOR every single cycle. There are multiple checks by multiple people in our process that check all of our documents and review those TOR. In terms of the adoption process, we have a three-prong review where we have a desk internal review, we have the week-long STAR panels, we have a GFSC review, we have an SSC review, and then the Council adoption." Focus Group F Participants questioned whether multiple review bodies are always adding value or sometimes revisiting the same issues.		At September 2025 GFSC meeting: ● Observed repetition of information and data results to different audiences. Consider ways to make this more efficient / less repetitive
4b-iii. Formally schedule rest periods.	“Overnight work from lead authors is unsustainable and potentially error-prone.” Focus Group J "it's an extensive adoption process that somebody the lead STAT or somebody from the STAT team is involved the entire way through... and it's really a year-long process." Focus Group F "STAR panels are still a huge thing to get through for a STAT team and they are burning hard to do this." Focus Group A		The three-stage STAR proposal was specifically framed as a way that doesn’t overwork stock assessment scientists.

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
4b-iv. Rotate review participation.	"Finding qualified people for STAR panels is increasingly difficult due to the significant time commitment required and a shrinking pool of fishery scientists." "...if you get either a reviewer that's particularly challenging or or one of the STAT team members that's particularly challenging, you can get conflict build up quite quickly. That's not helpful, but it's kind of part of the process. It's very difficult to control for that." Focus Group J There is a "challenge of finding qualified people to fill review seats," creating trade-offs among expertise, independence, and availability. Focus Group C	The TORs specify reviewer requirements (p. 11), making it difficult to ensure rotation: "*The pool of qualified technical reviewers is limited; therefore, staffing of STAR panels is subject to constraints that can make it difficult to meet the conditions above*," so the PFMC may need to weigh the trade off of meeting these reviewer criteria against capacity and burnout. The NWFSC Response to the 2014 Assessment Program Review recommended to "*engage in strategic human resource planning for the assessment program and explore opportunities to increase available resources for ground fish assessment.*"	
4c-i. Publish annual prioritization lists with rationale.	Focus Group C emphasized the Council's important role in prioritizing and deciding which assessments to conduct and uses the scientific information, along with advice from advisory bodies and the public, for management decisions; assessment prioritization is a critical initial step before conducting and reviewing stock assessments. "We do a stock assessment prioritization process, and generally, it's 'let's assess these like high value things,' and then 'oh yeah, let's	The TORs state that "*the extended time frame and resources required for such reviews limits the number of assessments reviewable at a given time, thus requiring a stock assessment prioritization and balance of assessment types to review each cycle*" (p. 6). The TORs state "*Council decisions on groundfish stock assessment priorities are aided by a formulaic approach for ranking groundfish stock assessments developed by*	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	pick up something that we probably need to do because we've ran out of projections to use because it's 10 years or older' or we think we should be doing it. So I think we've had a few of those instances lately where we've done assessments that are things have looked fine." Focus Group A "...the council setting the priority list of species and then also at the same time that's happening getting guidance from the science centers on what is feasible and what capacity they have to do assessments and what data is available. That's an important part of that prioritization step." Focus Group B Follow up email and comments from Jim Hastie also emphasized nuances of the prioritization process and recent enhancements.	*the Northwest Fisheries Science Center based on a national framework for stock assessment prioritization described in Methot (2015)*" (p. 10), but this approach may not be fully grasped by the larger stakeholder audience. This recommendation further emphasizes transparency encouraged under Theme 1. The SWFSC Response to the 2014 Assessment Program review recommended to "*develop a more rigorous prioritization process and identifying target assessment frequencies and types to balance needs with capacity...*" The NMFS Process Review Suggestions on the 2025 Assessment Cycle (2026) stated the PFMC SSC should "*reconsider specifications for update* assessments *and how they are* prioritized*, reviewed, and used for management... develop overarching* guidelines *on when an update assessment is and is not* appropriate *to conduct*."	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
4c-ii. Use prioritization lists as justification for alternative approaches.	"Some species receive data-poor or semi-data-moderate approaches because there are too many stocks and limited assessment capacity." 1-on-1 interview Data-limited outcomes may help “prioritize assessments for the next cycle.” 1-on-1 interview "I think we have realized that there needs to be more preliminary work done before the council's final decision on the availability of age data and and similar things before they determine entirely what is going to be done...we have a very formal process set up where a lot of information is brought to bear and provided to the entire Council family to evaluate the question of what species should be selected." Focus Group J	The TORs state that "*The Council also seeks to improve the timeliness of stock assessments by increasing the frequency of update assessments relative to full benchmark assessments*" (p. 10). We support this reasoning and extend the emphasis on assessment updates to data-limited and catch-only methods, where applicable.	At September 2025 SSC meeting: ● SSC members asked why catch only projections not applied to all species, which apparently leads back to prioritization process for which the Council had input.
4c-iii. Reinforce transparent scoring criteria.	"[the stock assessment prioritization tool] is intended to help rank, however they are very clear every time we use it that it is just a reference tool and it's not prescriptive. But it helps just semi-quantitatively rank all the species that we have in the FMP based on various factors like constituent demand and commercial recreational importance conservation risk, etc." Focus Group D Follow up email and comments from Jim Hastie also emphasized nuances of the prioritization process and recent enhancements.	Methot (2015) provides clear criteria for prioritization-related scoring. The Council may elect to explore ways to simply describe how this guidance is applied to their managed stocks and stock complexes. This is reinforced in the NOAA OST Implementing a Next Generation Stock Assessment Enterprise document (2018).	For the West Coast Groundfish Assessment Prioritization, Chantel Wetzel gathered and organized all of the data, and then created a web page to serve it to everyone. It and the automation of the Summary of Available Data doc were tremendous accomplishments, and represent pretty amazing sources of relevant information:

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
4c-iv. Link prioritization to workload planning.	"...so you really need three assessors for one species or four assessors if you were lucky." Focus Group F "... there was a species that was prioritized for this year that ended up getting dropped due to the limitations of being able to age the necessary samples for that. And so I think there is a real limitation caused by budget." Focus Group D "I think the elephant in the room is funding... if you go back and listen to the some of the conversations regarding prioritizing stock assessment" Focus Group I	The TORs state that "*The Council also seeks to improve the timeliness of stock assessments by increasing the frequency of update assessments relative to full benchmark assessments"* (p. 10). We support this reasoning given capacity constraints, as the available time and personnel are valid considerations when conducting prioritization. The NWFSC Response to the 2014 Assessment Program Review recommended to "*develop a formal and articulated approach to assessment prioritization to aid with staff, resource and other planning...*"	Follow up email and comments from Jim Hastie also emphasized nuances of the prioritization process and recent enhancements.
4d-i. Emphasize the continuum of stock assessments based on data availability.	Jason Cope suggested “moving away from strict categorization and emphasizing the continuum of stock assessments.” "...the other point the irony of pullback is that how the STAR panel went the data available that ended up in the final assessment were all available in 2021. So they could have done a full benchmark assessment in 2021 with the same outcome that we got in 2025 if they had reduced max age." Focus Group F "I've seen disagreement about how to treat data limited stock assessment results specifically." Focus Group D	The TORs state "Data availability produces a continuum of approaches..." (p. 7). The TORs Appendix D, Definitions of Species Categories for Groundfish Assessments and Rules for Making Category Assignments for Full or Update Assessments, describes what types of assessment approaches (and resulting management parameters) are specified by the PFMC and its SSC based on data availability. Referring to Update Assessments, the TORs state that "resource	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
		limitations constrain the number of full assessments that can be conducted and reviewed during an assessment cycle..." and "an 'update assessment' may be preferable when more current information is desired and there are other priorities for full assessments" (p. 7). The TORs state "It remains the long-term goal of the Council to substantially increase the number of groundfish stocks with full and data-moderate assessments provided sufficient data are available" (p. 10). Given capacity constraints, it may be to the PFMC's benefit to emphasize the relative value of data-limited assessments and catch-only methods. The NWFSC Response to the 2014 Assessment Program Review recommended "*to develop novel and improved approaches to stock assessment, but should also seek to make standardized tools more widely available...*"	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
		The NWFSC Report on the Analysis of Assessment Capacity and Target Frequencies for Conducting West Coast Groundfish Assessments (2024) states that "*Over time, however, 1) the number of groundfish species for which Category 1 or 2 assessments are desired for management, 2) the assessment development and review workload that is associated with assessing these species (as prescribed by the Fishery Management Plan, the Groundfish Assessment Terms of Reference, and tradition), and 3) the number of stock assessment scientists available to conduct Category 1 or 2 assessments have reduced the Agency's ability to deliver assessments for management use on a schedule that is consistent with identified target assessment frequencies.*"	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
4d-ii. Explain data usage and rationale when reviewing assessments using these methods.	Data moderate assessments produced pushback due to “the perception that available data was not fully utilized for the sake of speed.” "...this is one of the things where it has become contentious at times when results coming out of a data limited assessment are not consistent with what some stakeholders want. Then they question the validity of that method even though the methods have all been vetted in advance." - Focus Group F “Stakeholders and council members… [were] upset knowing that the data exists out there but were not used.” Focus Group F	The TORs Appendix D, Definitions of Species Categories for Groundfish Assessments and Rules for Making Category Assignments for Full or Update Assessments, describes what types of assessment approaches (and resulting management parameters) are specified by the PFMC and its SSC based on data availability. The TORs state "*highlighting research priorities should increase the likelihood that future stocks assessments can be raised to category 1*" (p. 14), though we note that increased capacity limitations may not always make the addition of category 1 assessments unilaterally desirable. The TORs state " *...the STAR panel should recommend the category for the assessment based on the definitions of species categories in Appendix D and associated rules for relating category designations with sigm*a" (p. 18).	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
4d-iii. Encourage STATs to continue employing data-limited/moderate approaches where viable, with adequate qualification and explanation.	"...it has become contentious at times when results coming out of a data limited assessment are not consistent with what some stakeholders want. And then they question the validity of that method even though the methods have all been vetted in advance." Focus Group F	The TORs describe the circumstances in which data-limited and data moderate assessments can be applied (p. 8-9), so the Council would benefit from ensuring that process participants (especially the industry and the public) are aware of these guidelines in the TORs; note the relation to recommendations 1a-iii. The TORs state "For some stocks selected for full assessments, the available data may prove to be insufficient for a category 1 assessment. In such cases, the STAT should consider whether simpler approaches appropriate for a category 2 or category 3 assessment can be applied. Simpler approaches usually make stronger assumptions and estimate fewer parameters but are less demanding of data. It is the responsibility of the STAR panel, in consultation with the STAT, to consider the strength of inferences that can be drawn from analyses presented and identify major uncertainties. If useful results have been produced, the STAR panel should review the appropriateness and reliability of the methods... and either recommend or reject the	

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
		analysis on the basis of its ability to provide useful information into the management process" (p. 14). The NWFSC Report on the Analysis of Assessment Capacity and Target Frequencies for Conducting West Coast Groundfish Assessments (2024) states that "*the suite of processes that comprise species selection, assessment development and review, and use of assessment results could benefit from a comprehensive joint Council-NMFS review that considers... possible explicit decisions about which species may need to revert to Category 3 assessments for purposes of informing harvest specifications.*"	
4d-iv. Develop outreach materials on these methods.	Participants emphasized the need to "effectively convey assessment results, uncertainties, and changes to stakeholders" to foster trust.	The SWFSC Response to the 2014 Assessment Program review recommended to "*establish a series of workshops..., participate in public fisheries events, and/or host regular "open houses" at PFMC meetings for targeted audiences...*"	
Feedback			

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
5a-i. Conduct earlier, iterative feedback check-ins (e.g., through the pre-assessment workshop and additional touch points).	"I guess if I ...could sort out all the logistics perfectly, I would break up the review process into more chunks and not just have one single STAR panel, but have maybe a first crack at review and then a second crack at review later. with some time in between." Focus Group D “Pre-assessment workshops should be extended… allowing fishermen… to provide inputs during data and model review… not only during sporadic comment periods.” Focus Group E “Frustration arises when assessments are presented at the very end of the process, with little opportunity for earlier engagement.” Focus Group E	The TORs state that "*the SSC should note any concerns for the next assessment*" (p. 28) but provides no additional guidance for categorizing issues to address for future cycles.	It is most often difficult (if not impossible) for the STAR and the STATs to effectively address public comments by the end of review panels. Project Team Observations At the Sept. 2025 GFSC meeting, the project team observed: there was confusion between the subcommittee and Council staff with respect to a request. We believe there should be an opportunity to review captured discussion points/requests to avoid these misunderstandings going forward.
5a-ii. Proactively solicit feedback following each assessment cycle.	"And one other process that we haven't mentioned is kind of a wrap-up meeting at the end of each cycle where folks get together and talk about the TOR... any changes to the TOR, learn what things went well and what didn't. And I think that's an important element here in terms of understanding what can be improved on." Focus Group D		

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
5a-iii. Integrate feedback reviews to include evaluations of hybrid meeting formats.	“Hybrid meetings increase participation, but balancing objectives and managing expectations is more difficult." Focus Group A “We are structuring very different types of conversations for different audiences… a preassessment workshop… a STAR panel… the council realm... A lot of them are kind of blending and overlapping… I’m just finding it really difficult with this new format to figure out how to balance… the objective and the purpose of each meeting.” Focus Group A		
5a-iv. Publicly summarize feedback themes and resulting adjustments.	“Fishermen feel their input is often unheard or not accounted for in a meaningful way…” Focus Group H "There isn't really a an off-ramp when you come into a situation that can be developed that it's challenging. I mean, again, Quillback is our golden example of of where we think we went wrong, but and I think there's some risk. The risk is how do I go back to the public now, our members, and talk to them about assessment that was done two years ago when the language that was used in the new assessment says that conservation or or um uh uh rest fishery restrictions are no longer necessary." Focus Group I "...when we get big changes, usually it's because the last assessment said the future is very uncertain, and then the next time you do an assessment, you get a different		

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
	answer." Focus Group F		
5b-i. Develop feedback communication guidelines.	"...concerns about the sensitivity of the SSC and the scientific community to critique…" 1-on-1 interview "...those that are engaged in the process, I think we're still having good conversations even when we don't agree." Focus Group E		
5b-ii. Establish cross-body workshops to exchange feedback.	"The face-to-face engagement between the stock assessment folks and the council family has really decreased… the sidebar, the casual conversation… is no longer happening very easily." Focus Group J "...some joint ownership of the process together. When people don't like what they see as a result is helpful because it is a joint, we're all in it together. The goal is to produce information for stock assessment, you know, stock assessments through a public process that is then used for management of a shared public resource like that, so just instead of sort of washing your hands of it and being like, 'yeah, what what did you guys do wrong?'" Focus Group F		
5b-iii. Encourage leadership to model communication practices.	"Current efforts by council staff aim to highlight opportunities for feedback on TORs to encourage broader participation…" Focus Group I		

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
5b-iv. Emphasize effective feedback examples.	“Pre-assessment workshops have contributed to stronger base models, reducing the need for significant changes during STAR panels…” Focus Group F		Project team observation synthesis suggested that the manner in which feedback is offered plays a large role in how well it is received and acted upon (closely related to recommendation 5c-ii below).
5c-i. Create a public engagement feedback tracker and the Council or SSC’s corresponding response.	"I feel for the fishermen who show up and feel like they might have something to say, but that it never gets heard or really accounted for in a meaningful way. They they kind of feel like they get lip service is my understanding from the outside... talking to them, it sounds like they feel like they sort of get lip service from the scientists, but then nothing actually changes." Focus Group H		Project team suggested that, at and after STAR panels, it is not immediately clear if or how perspectives from fishermen and the public are incorporated into science and management processes. No tasks/"requests" are actively developed stemming from fishermen input.
5c-ii. Incorporate responses to public input in meeting minutes.	“Fishermen feel their input is often unheard or not accounted for in a meaningful way…” Focus Group H		Project team observed that it can be difficult to effectively address and categorize public comments by the end of lengthy review cycles., and this approach may be beneficial to capture these perspectives for posterity. It both shows stakeholders that their feedback is being considered and not simply being discarded, as well as provides review process participants with documentation regarding recent and past comments provided and associated responses.
5c-iii. Explicitly encourage participants to provide engagement feedback in a constructive and specific way.	“Individual personalities… can quickly escalate conflicts…” 1-on-1 interview		Project team observation synthesis suggested that the manner in which feedback is offered plays a large role in how well it is received and acted upon.

Recommendations by Theme	Crosswalk		
Theme	**Focus Group/Interview Quotes**	**Reference Document Excerpts**	**Project Team Perspectives and Observations**
5c-iv. Include updates to the Council on how input shaped processes.	“The 2025 stock assessment cycle… [is] seeing more intentionally designed opportunities for public engagement.” 1-on-1 interview "...the name of the game is just trying to make sure people feel engaged and heard." Focus Group H		At the Nov. 2025 SSC meeting: A public comment said "it feels like assessments are simply being pushed through."
5d-i. Develop an internal feedback archive or tracking spreadsheet, emphasizing outcomes from post-STAR retrospectives.	"There was a number of things in the 2019 model that the STAR panel at the time had been made very clear. These should be looked at the next time it's given a benchmark." Focus Group D		Project team observation synthesis found value in maintaining a repository of feedback and associated changes for posterity to retain institutional knowledge. From Sept. 2025 GFSC meeting: there was an error correction identified for lingcod that should've been done "*since last cycle, when that information was available*"
5d-ii. Use findings to update TORs and training.	“A lack of explicit guidance on how and when to provide input on TORs has been a challenge…”Focus Group I "I think a key role in that is the revisitation of it every two years and the opportunity for that we have as scientists to propose changes to the SSC to be included." Focus Group E “Concerns around the TOR… suggesting a need for revamping… regarding specificity and flexibility.” Focus Group I	The NMFS Process Review Suggestions on the 2025 Assessment Cycle (2026) stated the PFMC SSC should "*reconsider and rewrite the TOR...*"	

Table E2. Detailed overview of changes to representation of focus group and interview quotes and perspectives included in the final report. Green indicates an included quote that was retained in its entirety, yellow indicates a provided paraphrase that was either adjusted to refine wording or be replaced with a direct quote, and red indicates a quote or paraphrase that was removed.

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
“The Council staff and members do a wonderful job ensuring that this [stock assessment review process] is fully transparent.”	Direct	Direct match.	1-on-1 interview; Focus Group F; Focus Group H	Retain quote.
“[the] challenge isn’t the science; it’s keeping the science, the process, and the people aligned.”	Concept	“We’re not like lining up… how that information can help each other... there’s this unbridgeable gulf… between a fisherman… and a statistical model.”	1-on-1 interview; Focus Group D; Focus Group H	Retain paraphrase.
“You almost have to be a veteran of STAR meetings to know when decisions actually happen.”	Concept	"It took me approximately four cycles, or eight years, to gain a decent understanding of the assessment process, review, adoption, and particularly the Terms of Reference (TOR)... I wasn't sure exactly when or how to provide input on that or when it changes.”	Focus Group D; Focus Group I; Focus Group B	Replace paraphrase with quote: "it took me approximately four cycles, or eight years, to gain a decent understanding of the assessment process, review, adoption, and particularly the TOR."

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
“struggle to see the through-line from data workshop to SSC adoption.”	Concept	“each side has information… but… we’re not lining up”; “there isn’t a single place… where the public can see the entire process.”	Focus Group D; 1-on-1 interview	Remove quotes, retain paraphrase, and add: "there isn’t a single place… where the public can see the entire process.”
“technically sound but hard to trace.”	Concept	“you can know the data… but how that is compiled… is the biggest challenge.”	Focus Group D; 1-on-1 interview	Remove quotes, retain paraphrase.
“It’s all there somewhere, but you have to know who to ask.”	Concept	“it pretty much is another full-time job… to track stock assessments”; “there isn’t a single place… where the public can go to see the entire process.”	Focus Group D; 1-on-1 interview	Replace quote with: "challenging to find information about the stock assessment review and adoption process... and add “data [are] sort of scattered everywhere."
“too much time re-locating files that should live in one place.”	Concept	"For the general public, it's difficult. I mean I think about how many people are where we are, which is fairly engaged. I'm still finding things. I believe there has been a huge effort to try and point to the places, the website getting rebuilt and the way it's laid out is much better. But	Focus Group I	Remove quote and replace with paraphase: "it is difficult for the general public, even those somewhat engaged, to navigate the

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
		understanding the PAM site and the SAFE documents and what that even is, like why do I need a SAFE, what's a SAFE document?... it is still very difficult to engage and I mean understanding an assessment cycle of an FMP. That's something I'm working on right now with staff for MREP is creating a visual like graphic type document that's linear that shows the assessment cycle for the FMPs."		available information."
“too much time re-locating files that should live in one place.”	Concept	"For the general public, it's difficult. I mean I think about how many people are where we are, which is fairly engaged. I'm still finding things. I believe there has been a huge effort to try and point to the places, the website getting rebuilt and the way it's laid out is much better. But understanding the PAM site and the SAFE documents and what that even is, like why do I need a SAFE, what's a SAFE document?... it is still very difficult to engage and I mean	Focus Group I	Delete; duplicative.

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
		understanding an assessment cycle of an FMP. That's something I'm working on right now with staff for MREP is creating a visual like graphic type document that's linear that shows the assessment cycle for the FMPs."		
"transactional"	Concept	"Virtual meetings increased access and efficiency, but reduced informal relationship-building and sidebar communication."	Focus Group I	Remove quotes, retain paraphrase.
“efficient but disconnected.”	Concept	"Virtual meetings increased access and efficiency, but reduced informal relationship-building and sidebar communication."	Focus Group I	Remove quote and replace with:"virtual meetings increased access and efficiency, but reduced informal relationship-buildin g and sidebar communication."

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
"surprise outcomes"	Concept	SSC meeting notes; term "unexpected" or similar used throughout Focus Group conversations. "We know that they're out there and then you get an assessment that shows something completely different." "...the Canary Rockfish assessment from last cycle, the results from that assessment were very surprising to many people... I think still communication around what has changed or for each assessment can be improved..."	SSC Meeting Nov. 2025; Focus Group I; Focus Group D	Delete quotation marks.
"don't know what a confidence interval really means,"	Concept	"I don't understand… sometimes the language they use"; "the science… is so deep… my brain cannot understand them fully."	1-on-1 interview; Focus Group B; Focus Group F	Remove quote and replace with verbatim quotes.
"bury the risk narrative in statistical language."	Concept	"Some assumptions feel really buried"; SSC meeting notes: SSC suggests it might be more about trust than scientific understanding, as most people, including many scientists, lack the qualifications to fully grasp	1-on-1 interview; Focus Group C	Remove quote and replace with paraphase: "Most people, including many scientists, lack the qualifications to

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
		the complex mathematical and statistical models.		fully grasp the complex mathematical and statistical models."
“people don’t really get the uncertainty."	Direct	Direct match.	Focus Group B	Retain quote.
"surprise outcomes"	Concept	"...the results from that assessment were very surprising to many people."	Focus Group B; Focus Group D	Remove quotes, retain paraphrase.
“I think some of them are transparent, particularly the ones that occur after the OFL is set… The ones that concern me are the ones that happen before that and how they are set.”	Direct	Direct match.	1-on-1 interview	Retain quote.
“we have P*, but that’s a perception of risk. It’s not tied to an individual assessment’s uncertainty,”	Direct	Direct match.	Focus Group E	Retain quote.
“the same question gets answered three different ways depending on who you ask,”	Concept	"There are different levels of understanding of the TOR depending on who you ask.”	Focus Group D	Replace paraphrase with quote: "there are different levels of understanding of the tour maybe depending on who you ask."

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
“we’re not always clear when we’re certifying science versus endorsing management.”	Concept	"[The Council] gets the scientific recommendation from the SSC… then [the Council] decides on things like management uncertainty and level of risk… slightly iterative thinking about implementing meaningful measures based on what comes out of the stock assessment.”	Focus Group E; Focus Group C; 1-on-1 interview; Focus Group B	Replace paraphrase with quote: "[the Council] gets the scientific recommendation from the SSC… then [the Council] decides on things like management uncertain and level of risk… slightly iterative thinking about implementing meaning measures based on what comes out of the stock assessment."
“It takes a year to figure out where your input even goes,”	Concept	"...wasn't sure exactly when or how to provide input.”	Focus Group I	Replace paraphrase with quote: "...[aren't] sure exactly when or how to provide input."
“You learn by doing and by making mistakes in public.”	Concept	“The stock assessment process is rigid, complicated, and often intimidating.”	Focus Group I	Replace paraphrase with quote: “the stock assessment

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
				process is rigid, complicated, and often intimidating.”
“By the time we see the model, the assumptions are already baked in.”	Concept	"Timing is key as far as important groups being represented because... the star panel is way too late. It has to be early in the process.”	Focus Group D	Replace paraphrase with quote: "timing is key as far as important groups being represented because... the STAR panel is way too late. It has to be early in the process."
"Data workshops have become more common whereas, in the past, that was something that was done only for certain stocks, or it was up to the assessors to reach out to the industry on a more informal basis"	Direct	Direct match.	Focus Group F	Retain quote.
We are not yet where we want to be in terms of participation, but it is growing.	Direct	Direct match.	Focus Group E	Retain quote.

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
“Sometimes we’re invited to talk data [sic] before it’s modeled, sometimes not. It depends on the stock.”	Concept	“Data workshops have become more common whereas in the past that was something that was sort of done for only certain stocks, or it was up to the assessors to reach out to the industry and do it on a more informal basis."	Focus Group F; Focus Group C; 1-on-1 interview	Replace paraphrase with quote: "data workshops have become more common whereas in the past that was something that was sort of done for only certain stocks, or it was up to the assessors to reach out to the industry and do it on a more informal basis."
“set the tone"	Direct	Direct match.	1-on-1 interview	Retain quote.
“You can’t engage well if you don’t understand what the scientists are showing you.”	Concept	"Unless you have context for what an assessment is showing, you can't really give them the input that would be beneficial."	1-on-1 interview	Replace quote with: "unless you have context for what an assessment is showing, you can't really give them the input that would be beneficial."
"doing more with less"	Direct	Direct match.	Focus Group F	Retain quote.

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
“There are too many stocks and too few analysts. It’s triage every year.”	Concept	“We don't have enough stock assessors"; "Part of the reason that we can't do assessments so frequently..is just because we have too many stocks to cover and not enough assessment scientists."	Focus Group E; Focus Group F	Replace paraphrase with quote: "part of the reason that we can't do assessments so frequently..is just because we have too many stocks to cover and not enough assessment scientists."
"erased institutional memory"	Concept	"State agencies on the West Coast have been hemorrhaging fishery people for a long time. I mean, they've been flat budgeted since the '90s, you could argue. And it used to be that you had, you know, very experienced scientists in Washington Fish and Wildlife and Oregon Fish and Wildlife and California Fish and Wildlife who knew um who knew a lot about a lot a lot of the species that we managed like very deep expertise and they would participate in these processes and sometimes do the	1-on-1 interview	Retain as paraphrase.

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
		assessments or contribute to the assessments and comment on the assessments."		
There's pluses and minuses to it. I think we have a lot of freedom that you don't have under some of the other processes in other parts of the country… but the biggest issue we have is throughput in terms of getting things done.”	Direct	Direct match.	Focus Group F	Retain quote.
“an endurance test, not a process”	Concept	"...the level of kind of overnight work as a lead author is not really tenable and potentially is error prone" Focus Group J "[Have] enough time to like have this step of the review process and this step of the process and everything laid out sort of sequentially in a way where we're not just struggling with all of this crazy overlap."	1-on-1 interview; Focus Group J; Focus Group A	Remove quotation marks.
“We finish one STAR and roll straight into the next. There’s no breathing space.”	Concept	“So many things overlap ... star one ... on top of star two deadlines ... on top of things that are happening with the... Council meeting and everything is so overlapping.”	Focus Group A	Replace paraphrase with quote: “So many things overlap ... star one ... on top of star two deadlines ... on top

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
				of things that are happening with the... Council meeting and everything is so overlapping.”
“sense of endurance rather than collaboration.”	Concept	"...the level of kind of overnight work as a lead author is not really tenable and potentially is error prone"; "[Have] enough time to like have this step of the review process and this step of the process and everything laid out sort of sequentially in a way where we're not just struggling with all of this crazy overlap."	Focus Group A; Focus Group J	Remove quotation marks and Italics; retain as paraphrase.
“We don’t know which species will be next until it’s already on the docket.”	Concept	“Which species out of all the ones we could possibly assess which ones do get assessed is important.”	Focus Group D	Replace paraphrase with quote: “which species out of all the ones we could possibly assess which ones do get assessed is important”
“Is the timeline that we've agreed to reasonable or appropriate for different levels of assessments? That's the	Direct	Direct match.	Focus Group E	Retain quote.

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
question I think we should be posing to ourselves. And I'm not sure what the answer is."				
"We're doing something similar [to research-track assessments] but on a much more constrained timeline."	Direct	"The research track they have this long timeline of being able to work on assessment and multiple like review check-ins of kind of like different big different changes within model where we're kind of the research track they have this long timeline of being able to work on assessment and multiple like review check-ins of kind of like different big different changes within model where we're kind of doing something similar but on a much more constrained timeline that we're doing this benchmark assessment that can have big changes."	Focus Group E	Retain quote.
"People hear 'data-limited' and think it means guesswork."	Direct	Direct match.	1-on-1 interview	Retain quote.
"They [stakeholders] question the validity of that method even though the methods have all been vetted in advance."	Direct	"...one of the things where it has become contentious at times when results coming out of a data limited assessment are not consistent with what some stakeholders want... they	Focus Group F	Retain quote.

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
		question the validity of that method even though the methods have all been vetted in advance."		
“In some cases, we were doing data limited assessments simply to get a peek at something that had never been assessed before because we have a throughput problem. We don't have enough stock assessors.“	Direct	Direct match.	Focus Group F	Retain quote.
“By the time you ask what we think, the ink’s already dry.”	Concept	"The pre-assessment workshop is too early because we don't have any data. We have no information of what the stock assessment is going to look like. But then by the time you get to the star panel, oh, it's too late. The assessment's already written. Like, we can't incorporate what you want meaningfully and get it done in the time frame."	1-on-1 interview	Replace paraphrase with quote: "the pre-assessment workshop is too early because we don't have any data. We have no information of what the stock assessment is going to look like. But then by the time you get to the star panel, oh, it's too late. The assessment's

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
				already written."
“Sometimes feedback feels like a reprimand, not a dialogue.”	Concept	"when [the assessment] goes to the council process and people start ripping, start attacking it, it can get very personal."	Focus Group F	Replace quote with: "when [the assessment] goes to the council process and people start ripping, start attacking it, it can get very personal."
“You speak up, they thank you politely, and then you never hear what happened.”	Concept	"I feel for the fishermen who show up and feel like they might have something to say, but that it never gets heard or really accounted for in a meaningful way. They kind of feel like they get lip service is my understanding from the outside... talking to them, it sounds like they feel like they sort of get lip service from the scientists, but then nothing actually changes."	Focus Group H	Replace paraphrase with quote: "fishermen who show up and feel like they might have something to say, but that it never gets heard or really accounted for in a meaningful way. They kind of feel like they get lip service.. from the scientists, but then nothing actually changes."

Report Quote	Status	Supporting Transcript Language (Verbatim or Closest)	Crosswalk Sources	Action
“Every cycle we rediscover the same problems because we don’t document what we fixed, or didn’t.”	Concept	“there were a number of things in the 2019 model that the STAR panel at the time had made very clear ... these should be looked at the next time it's given a benchmark” Focus Group D	Focus Group D	Remove quote and replace with paraphrase: at times, they discover similar issues that could have been addressed previously.
"How we talk about problems shapes whether people stay engaged."	Concept	"The name of the game is just like trying to make sure people feel engaged and heard."	Focus Group H	Remove paraphrase and replace with quote: "the name of the game is just like trying to make sure people feel engaged and heard."

Appendix F – Inventory of Report Revisions

Lynker identified several citations in the Reference section of the final report that were inaccurate or non-existent (i.e., “hallucinated”).

The following references were removed from the Reference section entirely:

Dick, E., Monk, M. (2024). *Stock assessment communication and stakeholder engagement on the West Coast* (NOAA Tech. Memo NMFS-SWFSC-665). NOAA Fisheries Southwest Fisheries Science Center.

Hilborn, R. (2024). Trust and transparency in fisheries science. *ICES Journal of Marine Science, 81*(4), 891–905.

Marine Resource Education Program (MREP). (2024). *Understanding stock assessment and Council decision-making.* Gulf of Maine Research Institute.

National Marine Fisheries Service (NMFS). (2024). *BSIA framework analysis for Council application.* NOAA Fisheries West Coast Region.

Punt, A. E., Hamel, O. S. (2023). Improving data-moderate assessment methods in U.S. groundfish. *Fisheries Research, 261*, 106664. https://doi.org/10.1016/j.fishres.2023.106664.

The following references were replaced in the report:

Original: National Marine Fisheries Service (NMFS). (2024). BSIA framework analysis for Council application. NOAA Fisheries West Coast Region.

Replacement: National Marine Fisheries Service (NMFS). (2019). West Coast Best Scientific Information Available (BSIA) Regional Framework."

Original: Marine Resource Education Program (MREP). (2024). Understanding stock assessment and Council decision-making. Gulf of Maine Research Institute.

Replacement: Gulf of Maine Research Institute. (n.d.). Marine Resource Education Program (MREP). https://mrep.gmri.org/

Several paraphrased excerpts from Focus Group discussions and 1-on-1 interviews were replaced by direct quotes and other paraphrases to better align with our proposed recommendations following additional review comprising our crosswalk (see Appendix E).

Unrelated to these document revisions and stemming from the additional review we conducted, we removed Recommendation 5d-iii. We found that the suggested additional collaborative reflection sessions are redundant with the outcomes of other recommendations. Incorporating assessment feedback earlier and more systematically within existing processes would likely achieve the intended benefits more efficiently, avoiding additional procedural burden and potential process fatigue.

Recommendations 3d-ii and 4b-iii were slightly revised based on additional review of reference material and improved understanding of PFMC processes with respect to the subject group(s) of the recommendations.

Throughout the report, we revised our use of italics to be more standardized for direct quotes. We also revised references to “TORs” to “TOR” to align with PFMC standard language use.

Other simple grammatical and formatting revisions were implemented throughout the document to support readability.