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OCEAN WISE

ASSESSING THE SUSTAINABILITY OF B.C. SALMON

OCEAN WISE'S NOVEL APPROACH FOR GENERATING SALMON RECOMMENDATIONS

MAY 2024

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- Dave Moore – Authentic Indigenous Seafoods Co-operative
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GLOSSARY

Table i. List of abbreviations and acronyms used throughout the report along with common phrases and terms used by Ocean Wise.

Key Terms	Definition
B.C.	British Columbia
B.C. Salmon	Referring to the 5 species of Pacific salmon (see Table ii) harvested throughout in British Columbia.
CU	Conservation Unit
Demo Fishery	Known as a demonstration fishery, these fisheries are established to test new methods of fishing or locations.
DFO	Fisheries and Oceans Canada
ESSR	Excess Salmon to Spawning Requirement
IFMP	Integrated Fisheries Management Plan
Not Recommended	Unsustainable seafood option that does not meet the Ocean Wise bar with a score of less than 2.8.
Ocean Wise (adjective)	Sustainable seafood option reaching Ocean Wise Recommended rating at a score of 2.8 or higher
PSF	Pacific Salmon Foundation
RAPSTA	Rapid Assessment Standard
Rating	The numeric score that results from the assessment process as determined by the Seafood Watch Standard.
Recommendation	A distinction for fisheries or products that they are a sustainable option based on a set of criteria.
SAP	Salmon Advisory Panel
Seafood Watch	Monterey Bay Aquarium's Seafood Watch ratings program
SMU	Stock Management Unit
SSF	Small-scale fishery; fishers who typically operate without boats, or on boats less than 15 meters in length, with relatively low annual catch volumes.
WSP	Wild Salmon Policy

Table ii. Species of Pacific salmon found in British Columbia.

Common Name	Scientific Name
Coho	*Oncorhynchus kisutch*
Pink	*Oncorhynchus gorbuscha*
Sockeye	*Oncorhynchus nerka*
Chum	*Oncorhynchus keta*
Chinook	*Oncorhynchus tshawytscha*

Table iii. Fishing methods and gear types used throughout this report according to classification and definition by Ocean Wise that best represents the fishing practices of salmon fisheries.

Gear Type	Specifications
Dip Net	Hand-held net used to scoop fish
Traps	Weirs, Fish Wheels, Barriers, Fences used to block or corral fish into a specific location for harvest
Seine Nets	Referring to beach seines, nets are cast to collect fish.
Gillnets	Net suspended in water column used to catch fish passing through a given space.
Trolling Lines	Lines towed behind vessels at a consistent, low speed
Dip Net (Hatchery)	Fish return upstream to the hatchery and are harvested individually, similar to brailing, where fish are concentrated in a net or at the fence/spawning channel, etc. of a hatchery and are selectively harvested with a dip net or likewise.

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EXECUTIVE SUMMARY

The global demand for seafood is growing with studies indicating that Canadian consumers prefer wild-caught, local products. Even further, British Columbia's wild salmon is one of Canada's most well-known seafood products with high consumer demand driving average annual sales between $150 million and $250 million. Pacific salmon is not just an important food item for consumers and restaurants, it holds tremendous cultural significance to the First Nations of the Pacific Northwest and its fisheries continue to sustain livelihoods throughout the province. Yet, sustainable, wild-caught options have been difficult to identify in recent years as eco-labelling programs have grappled with the challenges associated with assessing Pacific salmon species: Chinook, Coho, Pink, Chum, and Sockeye. British Columbia (B.C.) salmon fisheries are inherently complex, and assessing the sustainability of five wild salmon species, and multiple populations each with their own mosaic of run timings has been a costly and resource intensive challenge for sustainable seafood programs and fisheries managers for decades. Because of these challenges there has historically been limited ability to distinguish between sustainable and unsustainable B.C. salmon options.

This report outlines a novel approach – combining data analysis and ground-truthing – to assess B.C. salmon fisheries in a cost-effective yet scientifically rigorous manner representative of real-world fisheries. Here we outline the use of Ocean Wise's Rapid Assessment Standard (RAPSTA) framework to assess the sustainability of B.C. salmon providing more granularity and increased attention to at-risk stocks. Our methodology leveraged datasets from Oceana Canada's Fishery Audit, along with supplementary data from the Pacific Salmon Foundation's Salmon Explorer tool. These sources are matched to Seafood Watch's Salmonid Standard to generate preliminary sustainability ratings for Conservation Units of wild-caught B.C. salmon. We have also established a Salmon Advisory Panel (SAP) that serves to provide expert guidance on the unique challenges and conservation measures of each fishery. Through this approach we were able to include Excess Salmon to Spawning Requirement, demonstration, terminal, and community-based fisheries in the assessment process, recognizing their vital role in sustaining the livelihoods of First Nations communities and small-scale fisheries while contributing to a more holistic evaluation of salmon sustainability.

In total, we have developed a list of 14 new recommendations for wild-caught B.C salmon which include all 5 species across 9 different fisheries and locations throughout the province. We are encouraged by the flexibility of our approach and plan to release additional B.C. salmon recommendations as new information becomes available during salmon fishing seasons and refined using expertise from the SAP.

INTRODUCTION

Historically, small-scale and community-based/managed fisheries have faced exclusion from seafood certification and recommendation programs, including Ocean Wise. This exclusion often stems from data limitations, cost barriers, and organizational capacity constraints. Similarly, sustainability assessments for B.C. salmon fisheries have been further sidelined due to salmon's complex life histories, seasonality, and run timing that make them unique from other fisheries. This has left Ocean Wise without a comprehensive or diverse list of wild salmon recommendations for many years. In response to the pressing need for evaluation of domestic Canadian seafood products, including B.C. salmon, Ocean Wise developed the Rapid Assessment Standard (RAPSTA), which leverages publicly available data, drawing from sources such as the Oceana Canada Fishery Audit, Pacific Salmon Foundation's (PSF) Salmon Explorer Tool, and Seafood Watch Standard Reports, to generate a fresh set of precautionary sustainability ratings. To further inform our salmon recommendations, we have also assembled the Salmon Advisory Panel (SAP) which comprises leading experts on Pacific salmon with a diverse representation across background, titles, and identities. Together, these innovative tools enable fast and rigorous assessment of fishery sustainability and we have now adapted the process to include B.C. salmon ratings.

For Canadian businesses and consumers, the assessment of B.C. salmon sustainability is of paramount importance. As the global demand for seafood grows, studies have shown that Canadian consumers prefer wild-caught, local products and are increasingly concerned with buying sustainable seafood (Colombo et al. 2024). Wild B.C. salmon is a key contributor to the economy of British Columbia and Canada, generating between $150 to $250 million in direct and indirect revenue each year (Ministry of Agriculture and Food, 2022; British Columbia Salmon Marketing Council, 2023). Not only does this place wild-caught salmon on a global stage, but it is essential to the lives and culture of First Nations communities throughout Canada's Pacific coast. In the absence of recommendations from Ocean Wise all wild B.C. salmon is considered equal – that is: either unassessed or unsustainable – meaning the average seafood purchaser has limited information about the product to make an informed decision. Thanks to our new approach, Ocean Wise will be able to provide consumers with a credible sustainability rating for all 5 species of Pacific Salmon (Chinook, Sockeye, Pink, Coho and Chum). Ensuring B.C. salmon is fished sustainably helps us protect the health and wellbeing of our ocean ecosystems and those that

depend on it. With over 150 unique commercial fisheries targeting the five species of B.C. salmon, a comprehensive understanding of the associated challenges and conservation efforts is necessary. Some of the persistent challenges to understanding the sustainability of different stocks include the health of target stocks, depleted runs, habitat degradation, droughts, rising global temperatures, artificial production, disease, and more.

Ocean Wise assesses fisheries environmental performance based on standards established by the Monterey Bay Aquarium's Seafood Watch program. In this case, the Salmonid Standard for the evaluation of salmon species evaluates 5 criteria: 1) Target Stock Health, 2) Impact on Other Capture Species, 3) Management Effectiveness, 4) Impacts on the Habitat and Ecosystem, 5) Impacts of Artificial Production. Rigorous in its evaluation criteria, RAPSTA closely mirrors the Seafood Watch Standard. It integrates indicators of stock health, impacts on other species and ecosystems, and fisheries management strategies to determine a final sustainability score. Since its release in 2023, RAPSTA has demonstrated its effectiveness by achieving a 100% matching rate with Ocean Wise's recommended options. Moreover, it facilitated the creation of 180 new sustainability ratings for marine fishes and invertebrate species in Canada, which previously excluded salmonid, until now.

The complexity of issues facing salmon fisheries and stock management in B.C. cannot be overstated. Pacific salmon range along the entire Pacific rim coastline —from South Korea to Southern California - and are harvested across both Canadian and United States jurisdictions. Salmon are a schooling fish that form large groups of fish with mixed populations and other salmon species. In mixed-stock fisheries, different salmon populations are caught together, making it difficult to target specific stocks. This creates significant challenges for salmon sustainability where endangered populations are co-occurring with healthy ones resulting in the overharvesting of vulnerable stocks and unintended consequences for the overall health of salmon populations. Currently, salmon stocks are divided into Stock Management Units (SMU) and Conservation Units (CU). This division serves several purposes, including preserving genetic diversity, protecting endangered populations, supporting sustainable fisheries management, and facilitating scientific research. SMUs focus on management and conservation, while CUs are designed for the conservation of at-risk populations. In Canada, Pacific salmon fisheries and conservation are overseen by Fisheries and Oceans Canada (DFO). As fisheries are managed at varying scales, we used stock identifications from DFO to guide the granularity of our assessments.

In 2005, DFO published the Wild Salmon Policy (WSP) to better manage the protection and sustainability of wild salmon in Canadian waters. The WSP operates on principles of ecosystem-based management, where salmon conservation is considered in the context of their broader ecological environment. Central to the WSP are scientific research and data collection, ensuring that decisions regarding salmon management are well-informed and evidence based. Collaboration with Indigenous communities and stakeholders is encouraged, acknowledging the significance of Indigenous perspectives and traditional knowledge in salmon conservation efforts. The policy's goal is to sustainably manage salmon stocks, safeguarding their long-term health and productivity, while regular monitoring and reporting help assess its effectiveness and adapt management practices as needed. Despite these efforts, salmon stocks are facing continued declines, due to compounding issues such as mixed-stock overfishing, data deficiencies, habitat loss, and climate impacts.

Several management strategies have been used across B.C. salmon fisheries to support salmon stocks. Integrated Fisheries Management Plans (IFMP) outline regional plans for salmon stocks and include the most recent scientific data and decisions. Mechanisms such as long-term closures have been implemented in the hopes of limiting fishing pressure on endangered salmon runs, with 22 such closures identified in 2022; they remain in place until strong indications of population rebuilding are observed (DFO 2023). Equally as critical are more localized salmon management strategies such as regional or community-based efforts like the Area 23 Roundtable (or Alberni Roundtable), a co-management structure that not only ensures buy-in to conserve salmon stocks across rights holders but also plays an important role in the equitable distribution of the harvest. While co-management structures for salmon fishery management have been implemented to improve inclusive decision making among fishery stakeholders, data deficiencies and a lack of knowledge integration continues to cloud judgements related to long-term Pacific salmon sustainability. Data collection and dedicated efforts to updating stock assessments are severely lacking. While local conservation organizations, research groups and academic institutions have helped to fill in knowledge gaps, more work is needed to understand the health of wild salmon populations.

The influence of hatcheries is yet another aspect that complicates the sustainability landscape of wild salmon. While hatcheries can contribute to the production of salmon, their impact on wild salmon populations and genetic diversity is a matter of concern. Hatchery-raised salmon may interact with wild salmon, competing for resources and potentially leading to genetic dilution and the reduced fitness of wild populations. For our recommendations, we use the best available science to assist in our evaluation of enhancement programs and the influence they have on wild populations. Expertise from the SAP is also leveraged to evaluate hatchery impact and will be outlined throughout this report.

Understanding the sustainability of different salmon stocks in B.C. is a multifaceted challenge. Ongoing efforts to surmount barriers to salmon sustainability are essential for the long-term health of all 5 B.C. salmon species. The primary objective of this report is to use RAPSTA and expertise from the SAP to evaluate the sustainability of Pacific salmon in B.C. whilst leveraging on-the-ground information and the best available knowledge to inform outcomes. This assessment process is aligned with Seafood Watch's criteria for sustainable salmonid fisheries and is further refined by the SAP to ensure scoring outcomes reflect conditions at the fishery level. The SAP's expertise and collective experience is instrumental in reviewing the final RAPSTA outcomes for accuracy, ensuring a comprehensive assessment of Pacific salmon sustainability.

RAPSTA offers an innovative approach that allows for swift and precise assessments of fisheries' environmental performance, enabling us to expand our assessment reach to encompass new species and regions. Recommendations for sustainable salmon fisheries will continue to be released as new information becomes available. For RAPSTA we consider the seasonality of the fishery to ensure in-season adjustments are possible and that recommendations are relevant to products available on the market in a given year. Fishery sustainability will be continuously monitored by both the SAP and Ocean Wise’s Science Team throughout fishing seasons and may be adjusted accordingly. As with typical RAPSTA ratings, these recommendations are subject to change at any time.

METHODOLOGY

OVERVIEW

In this assessment process, we leverage data from the Pacific Salmon Foundation and Oceana Canada Fishery Audit Salmon Appendix to enhance our RAPSTA methodology and evaluate the sustainability of Pacific salmon in B.C. For more information on our data providers see Appendix A. By aligning with the criteria in Seafood Watch's Salmonid Standard (Seafood Watch 2020) our methodology enables us to consider a range of factors, including CU health, fishing practices, management effectiveness, and habitat conservation. Through iterative reviews and collaboration with experts and organizations dedicated to salmon conservation as part of our SAP, we have further refined the assessment process, adding an additional level of scrutiny to our list of preliminary salmon ratings. As illustrated in Figure 1, the process begins with the collection of open-source data that is used to generate a set of ratings for salmon CUs using RAPSTA methodology (see Schiller & Renshaw 2023 for more on RAPSTA methodology); RAPSTA-assessed salmon also includes an additional criterion for hatchery impacts on wild populations. From here the Ocean Wise Science Team refines the results for presentation to the SAP. Then, the SAP will review the results and may give advice for re-evaluation or scoring amendments. This process is repeated until consensus is reached by the SAP on which salmon stocks meet the Ocean Wise sustainability standard. Ultimately, Ocean Wise makes the final release of ratings and assumes all responsibility for its recommendations. This iterative process provides a precise and well-informed approach to evaluating the sustainability of B.C. salmon, ultimately reinvigorating support for B.C. salmon producers and businesses that seek local, sustainable wild-caught salmon.

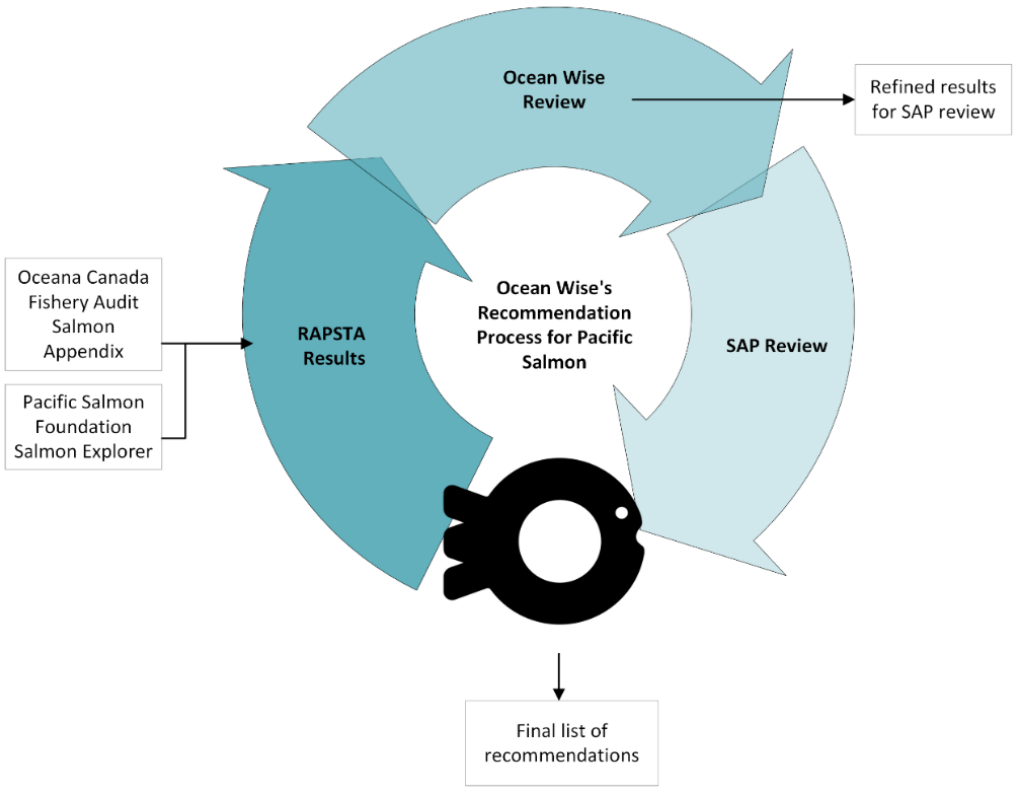

Figure 1. Ocean Wise's process for generating B.C. salmon ratings and recommendations, outlining the phases starting with data collection and RAPSTA analysis for salmon, followed by a review and refinement by Ocean Wise's science team before being reviewed the Salmon Advisory Panel (SAP). This process results in a list of salmon stocks that meet our standard of sustainability and can be repeated cyclically as many times as needed before a final decision is made by Ocean Wise with general agreement from the SAP.

SALMON ADVISORY PANEL

The Salmon Advisory Panel (SAP) was established to address the challenges of B.C.'s salmon fisheries and to ensure the robustness of our sustainability recommendations. Comprising multidisciplinary experts with in-depth knowledge of B.C. salmon stocks, the SAP's primary function is ensuring the accuracy and integrity of our assessments by providing review of Salmon RAPSTA results and overseeing the final recommendation process.

Beyond review, the SAP actively identifies and addresses knowledge gaps in our understanding of salmon sustainability, including factors like gear modifications, fisheries management practices, and the integration of Indigenous Knowledge. Additionally, the SAP investigates systems that support well-managed community-level fisheries, providing insights into the dynamics of sustainability within local communities. In essence, the SAP serves as a specialized body dedicated to advancing our assessment methodologies, aligning them with the latest knowledge, and providing robust and well-informed recommendations for salmon sustainability in British Columbia. Members of the SAP participate voluntarily.

RAPSTA METHODOLOGY

The methodology employed in this assessment adapts the Ocean Wise Rapid Assessment Standard (RAPSTA), as detailed in the RAPSTA Report 2023, to align with the Seafood Watch Salmonid Standard (Schiller & Renshaw, 2023; Seafood Watch, 2020). The Appendix contained in this report outlines the decision-making process used to guide scoring adjustments made by the SAP.

Criterion 1: Stock Health and Abundance

For Criterion 1.1, which assesses Stock Health, we utilized a measure of CU health, available from Ocean Wise and Oceana Canada salmon datasets. Oceana Canada provided the latest biological status of CUs based on the WSP status assessments conducted by DFO. CUs were categorized as Red, Amber, Green, Grey, or To Be Determined. Each status corresponded to an equivalent scoring descriptor from the Salmonid Standard: Healthy (Green), Cautious (Amber), Uncertain (To be Determined), and Critical (Red). CUs assigned a Grey status (extinct or extirpated) were excluded from analysis. In cases where CUs received mixed ratings, the lowest possible score was assigned (e.g., Green/Amber scored as Cautious). PSF data was further used to refine these scores based on their classifications of CUs stock health as Good, Fair, Poor, or Data Deficient. Where PSF assigned a lower ranking to the CU, a precautionary approach was applied to amend the overall score for Criterion 1.1. Additional data, including estimates of exploitation rate (PSF) and habitat risk (Oceana Canada Supplementary Material), were made available to the SAP to further support their decision-making process and scoring of Criterion 1 (DFO 2005; Holt et al. 2009; Pacific Salmon Explorer Technical Report).

Criterion 1.2, which assesses Exploitation Rate, was evaluated with caution due to the absence of reference points for many CUs. As a result, this criterion's overall score was capped at a Moderate level (3). Post-RAPSTA analysis, the SAP and Ocean Wise's Science Team consider the use of exploitation rate to refine the scoring for this criterion where applicable. Scoring for terminal fisheries within larger CUs was conducted based on available information. When deemed non-representative for the specific terminal fishery, SAP review or discussions with fishery representatives were essential to inform scoring.

Criterion 2: Bycatch

Bycatch (Criterion 2) and Impact on Habitat (Criterion 4) scores were predominantly determined by the gear type used in the fishery. When gear type was known, we employed the standard RAPSTA procedure, assigning average scores according to fully assessed fisheries matching the gear type and location. Notably, Bycatch and Impact on Habitat scores were reviewed for sensitive species, such as those listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), specific to each CU and their potential for bycatch in the fishery. Where gear types were unknown, precautionary scoring from commonly used gears in Salmonid fisheries was applied and refined by the SAP according to fishery practice on the ground. Specialized gear types, alternative management and monitoring, and habitat impacts in terminal fisheries were considered differently than in mixed stock fisheries. In such cases, scores for Bycatch and Impact on Habitat were determined for each CU individually, based on Seafood Watch Salmonid Standard by the Ocean Wise Science team, and reviewed by the SAP.

Criterion 3: Fisheries Management and Data Collection

Criterion 3.1, Management and Implementation was informed by benchmarks that define salmon stock health. A Highly Effective score was assigned if benchmarks were available, and the stock was known to be Healthy. Stocks with Critical scores in either Criterion 1 or Criterion 2 defaulted to Ineffective, while all others scored Moderately Effective. Modifications to Criterion 3 scoring were made as additional information became available. For instance, evidence of dockside monitoring, logbook records, or equivalent data supplied by various stakeholders was able to influence scoring outcomes if available. The SAP provided data where applicable, and scoring was refined by the Ocean Wise team according to a series of guided questions adapted from the Seafood Watch Salmonid Standard (See Appendix). In cases where management measured above and beyond typical DFO management practices, scoring was adjusted to a 4.

Criterion 4: Habitat Impacts

Similar to the method for scoring Criterion 2, the average scores for 'Habitat Impacts' in the Ocean Wise database, specifically those determined in previously assessed salmon fisheries, were applied for each 'Location' and 'Method' combination. These averages were then applied to the Gear-Location combinations for each CU in the Fishery Audit Salmon Appendix. Once again, scoring was modified based on evidence from the SAP if fisheries were considered to have minimal impact on their ecosystems due to mitigation measures like gear use.

Criterion 5: Hatchery Influences

A fifth criterion (Criterion 5x) was added to the RAPSTA assessment of salmon to consider the influence of hatchery fish on the natural salmon population. Impact scoring was based on PSF data according to their characterization of enhancement level (PSF 2023), categorized as High, Moderate, Low, None, and Not Available (NA), and aligned with the Seafood Watch Salmonid Standard as Major (High), Moderate (Moderate, Not Available), and Minor (Low) impact for Criterion 5.1. Where PSF indicated that impact was 'None', Criterion 5x was left unscored. Decisions for Criterion 5.2 were dependent on the availability of data and may be refined based on SAP advice. In cases where Hatchery Impact data for C5.1 was unavailable, the default score for 5.2 was Low (1), while available data received a score of Moderate (2.33). Fisheries dependent on hatchery fish were scored similarly to their unenhanced counterparts, with acknowledgment of impacts on the sustainability of surrounding runs.

Ratings Calculation

Following the methodology of the Seafood Watch Standards, the overall score was calculated by taking the geometric mean across all scored Criterion. Where Criterion 5x was scored, the geometric mean is considered across all previous 4 Criterion with a modifying factor for Hatchery Influence scores. See Appendix C for calculation formulas. This procedure was followed for all ratings. Scoring influences by the SAP were only used to re-calculate each Criterion score and never to adjust a final score.

Other Considerations

Due to data deficiencies, several criteria received mid-level, or low scores as called for by the Salmonid Standard. These scores influenced the final recommendation status. To enhance confidence in our recommendations, each CU underwent initial review by the Ocean Wise Science Team and subsequent review by the SAP before assigning a final recommendation status. The selection of CUs for review was based on positive scoring using conservative gear type estimations or strategic identification by the SAP. In some cases, fisheries operating across several CUs were identified and CUs were grouped to reflect the scale of the fishery. In these cases, the lowest score of all CUs was used as a base score. Additional terminal fisheries highlighted by the SAP as potential candidates for Ocean Wise recommendation were also considered for inclusion.

The RAPSTA framework for salmon assessment incorporates additional considerations and changes per the guidance of the SAP (Appendix B). Notable modifications include the definition of Rightsholder inclusion in management and decision making separately from stakeholder consultations, and strong suggestions to include criterion related to the community benefits and economic return from fisheries. While effort was made to incorporate traditional knowledge in the current RAPSTA process, significant modifications to the standard, such as those mentioned above, have yet to be implemented in the evaluation of ratings.

RESULTS

RAPSTA analysis for B.C. salmon was able to provide scores for 2,299 combinations of salmon CUs using 5 different gear types (Gillnets, Seines, Trolling Lines, Traps (Weirs, Barriers, Wheels, etc), and Dip nets). Of these, we refined the results to 380 CU-Gear combinations eligible for Ocean Wise recommendation based on preliminary RAPSTA scoring analysis. At this stage the SAP reviewed a refined list and provided additional considerations that allowed us to amend scoring for a handful of CUs (ex., by either increasing or decreasing Criterion scores). After this initial SAP review, the list of CUs for Ocean Wise consideration was reduced to 28. This short-list was given to the SAP for a second review prior to making the final decisions. During discussions with the SAP the initial gear types used for analysis were refined based on verification at the fishery level. This resulted in the addition of a sixth gear type where Dip Nets (Hatchery) has been developed to reflect the harvesting of salmon at hatcheries using minimally invasive methods. At this stage the SAP identified the scale of assessment to reflect either individual CUs or larger geographic areas containing several CUs. In total, we have developed 14 new recommendations including all 5 salmon species across 9 fisheries and locations.

Ocean Wise partners can apply the Recommended logo to all products listed in Table 1 as per the Ocean Wise Branding Guidelines. However, due to the nature of salmon runs and their seasonality, these recommendations are subject to change at any time, unlike previous RAPSTA results which hold for one calendar year. This allows Ocean Wise to continue to refine and amend scoring when new data becomes available. Any changes to ratings will be run through the review process outlined in Figure 1.

RECOMMENDATIONS

The following list of recommendations (Table 1) is a product of RAPSTA analysis for B.C. salmon, Ocean Wise refinement, and SAP guidance. We have chosen to outline the CUs with the highest confidence of sustainability according to factors outlined in our methodology. Ratings that reach a score of 2.8 or above are considered Ocean Wise Recommended. This list is not comprehensive, and we have only highlighted those reaching Ocean Wise Recommended status according to the most precautionary standards.

Table 1. Ocean Wise recommendations for wild-caught B.C. salmon and their ratings based on the RAPSTA framework and SAP guidance. CU ID refers to the identification number used for each conservation unit as used by DFO and PSF. Scores are provided for each Criterion (C) 1 through 5x where appropriate.

Seafood Name	Location/ Fishery	Method	C1	C2	C3	C4	C5x	Overall Score
Salmon, Chinook	Robertson Creek Hatchery | ESSR	Dip Nets (Hatchery)	3.413	5.000	3.000	3.873	2.159	3.219
Salmon, Chinook	Barkley Sound/Somass - Area 23 | WCVI CHINOOK SALMON	Gillnets (Drifting) & Seine Nets	3.413	3.011	4.000	3.530	2.159	2.978
Salmon, Chinook	Area F Troll	Trolling Lines	2.644	2.330	4.000	4.472	2.644	2.858
Salmon, Chum	Fraser Chehalis - Fall (late) run only ESSR | Lower Fraser | FRASER CHUM SALMON	Trap (Hatchery)	2.644	4.278	3.000	3.674	2.159	2.867
Salmon, Chum	Nitinat Lake	Gillnets (Drifting)	2.644	4.278	3.000	3.570	2.159	2.846
Salmon, Coho	Robertson Creek Hatchery	Trap (Hatchery)	3.413	5.000	3.000	3.873	2.159	3.219
Salmon, Coho	Area F Troll	Trolling Lines	3.318	2.330	4.000	4.472	2.644	3.025
Salmon, Pink	Area F Troll	Trolling Lines	2.644	2.330	4.000	4.472	NA	2.858
Salmon, Pink	Pink demo fisheries - (Area 3)	Seine Nets	3.310	2.330	4.000	3.315	NA	3.180
Salmon, Sockeye	Barkley Sound/Somass - Area 23 | Great Central, Sproat | WCVI - BARKLEY SOCKEYE SALMON	Gillnets (Drifting) & Seine Nets	3.318	1.920	4.000	3.570	NA	3.088
Salmon, Sockeye	Meziadin River | Meziadin | NASS SOCKEYE SALMON	Dip Net	3.318	4.278	3.000	4.472	NA	3.715
Salmon, Sockeye	Barkley Sound/Somass - Area 23 | Henderson |	Gillnets (Drifting) & Seine Nets	2.644	1.920	4.000	3.570	NA	2.918

	WCVI - BARKLEY SOCKEYE SALMON							
Salmon, Sockeye	Babine Lake - Fulton & Pinkut Spawning Channel terminal fisheries	Seine Nets	3.318	3.011	4.000	3.570	2.159	2.965
Salmon, Sockeye	Babine Lake - Fulton & Pinkut Spawning Channel terminal fisheries	Traps	3.318	4.278	4.000	3.674	2.158	3.261

EVALUATION OF CONSERVATION UNIT SUSTAINABILITY

Through the RAPSTA approach, we have compiled what we believe to be a highly comprehensive dataset for the assessment of wild-caught B.C. salmon sustainability. Although we rely on the best available knowledge, our analysis still represents an incomplete snapshot of B.C. salmon fisheries given the complexities and challenges related to data collection and the resulting data deficiencies. This approach is complemented by precautionary recommendations, aligning with the principles of responsible fisheries management. It is important to note that some of the recommended CUs fall within the Excess Salmon to Spawning Requirement (ESSR) category where licenses are issued to harvest surplus salmon in various areas (DFO 2023). Each year or season, some of these recommendations may not be viable due to management decisions or poor returns that prevent harvest, at which time they will be reviewed and amended as needed. We have also based these recommendations on the likely 'Gear-Location' combinations and leveraged the SAP to ensure all recommendations for salmon are represented accurately and available on the market. We have ensured open communication is available through the SAP to adjust any recommendations according to fishery performance during fishing seasons. The current list of recommended items typifies the highest-scoring options across RAPSTA-assessed salmon outputs in addition to moderate scoring CUs where the SAP was able to better inform Criterion ratings.

CHALLENGES AND LIMITATIONS

Despite notable progress, the pursuit of salmon sustainability assessments is not without its challenges. One significant hurdle lies in making the assessment process representative for the full spectrum of fisheries, particularly those operating on a small scale. The recommendations outlined in this report are

proof of concept for a RAPSTA approach for Pacific salmon, and there are likely more fisheries that meet our sustainability criteria. Given the volume of initial RAPSTA outcomes and number of potential fisheries combinations, the SAP was limited in its capacity to come to consensus on any additional fisheries. We will continue to analyze and review CUs seasonally and adapt ratings where and when it is needed. Nevertheless, it is essential to acknowledge that these assessments involve some degree of subjectivity, varying based on the experience and expertise of the SAP and the available data. However, by following Ocean Wise's decision rules, Seafood Watch's Salmonid Standard and a precautionary approach, we are confident that the resulting recommendations reflect highly sustainable fisheries.

FUTURE PROSPECTS

In order to ensure long-term sustainability and a more comprehensive approach to wild B.C. salmon recommendations, we at Ocean Wise must continue engaging at the fishery level. This approach not only aids in making assessments more robust and efficient but also helps to identify knowledge gaps that need to be addressed at a fishery level where harvest most directly impacts livelihoods. A more collaborative approach fosters an environment where valuable insights and local perspectives can guide our process, whilst supporting the best available knowledge and high-resolution data collection. Implementing standard changes that allow for the inclusion of rights holders and the integration of Indigenous Knowledge alongside typical Western science represents a critical step forward. Importantly, within the context of B.C.'s coastal communities, many salmon are harvested through small-scale or community-led operations, such as terminal fisheries, and play a vital role in supporting the sustainable livelihoods of First Nations communities. Recognizing the cultural importance of salmon to the First Nations of B.C., as well as its role in providing food security and jobs to these communities, Ocean Wise is piloting processes for stakeholder and Rights holder consultations and interviews. This initiative aims to embed local knowledge and social indicators into our assessment process, creating a more equitable and holistic understanding of sustainability for fishers and families reliant on salmon resources —ultimately enhancing the robustness of RAPSTA assessed salmon. Assessing livelihood sustainability and accounting for external factors that influence fisheries sustainability is yet another aspect of sustainability assessments that requires consideration. For instance, factors like restoration efforts at the CU level and the resilience of the fishery to climate change are often overlooked in current seafood assessments. A more comprehensive approach is vital to ensuring the long-term sustainability of salmon stocks under changing ocean, river, and land conditions.

A persistent challenge is understanding the economic benefits of achieving a sustainability eco-label and how they may or may not incentivize fisheries improvement and influence consumer behaviour. Our goal at Ocean Wise is to encourage the preference for sustainable seafood throughout all levels of the seafood supply chain from consumer to supplier to producer. We know there is a willingness among consumers to pay a premium for sustainable seafood and our goal is to help differentiate unassessed versus unsustainable seafood so that these premiums are realized at the small-scale fisher and family level (Columbo et al., 2024). To ensure the effectiveness of eco-labels, we must now start to analyze the supply chain of recommended and certified sustainable seafood.

CONCLUSION

In conclusion, the evaluation of conservation efforts in B.C.'s salmon fisheries reveals the complexities and nuances involved in achieving sustainability. The assessments rely on the best available knowledge while incorporating a precautionary approach. Challenges include making the assessment process representative for a diverse range of fisheries, integrating Indigenous knowledge, understanding the economic benefits of sustainability, and keeping pace with a dynamic environment. To secure long-term sustainability, continued engagement at the fishery level is key, as it not only enhances efficiency and robustness but also identifies knowledge gaps. Integrating rightsholder perspectives and Indigenous Knowledge alongside Western science is essential for comprehensive assessments. Case studies, such as the ongoing one with the Conuma River, provide valuable insights into creating a just, fair, and sustainable livelihood system. Additionally, the assessment process needs to account for livelihood sustainability and external factors influencing fisheries sustainability, such as climate change and habitat restoration efforts. These comprehensive efforts align with Seafood Watch's assessment criteria and contribute to the broader goal of sustainable salmon fisheries in British Columbia.

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APPENDIX A: DATA PROVIDERS

Oceana Canada

Oceana Canada is a leading non-profit ocean conservation organization at the forefront of advocating for sustainable fisheries and ocean protection in Canada. Their mission is to drive transparency and promote sustainable management practices within the fishing industry. Since 2017, one of the cornerstone initiatives by Oceana Canada has been the Annual Fishery Audit. This comprehensive assessment delves into Canada's marine fisheries to evaluate their performance based on stock health and current levels of management. Our RAPSTA process was developed based on these annual audits and the synergies of their open access data with Ocean Wise assessment criteria. In 2022, Oceana Canada released their inaugural Salmon Appendix which expanded their audit to include Pacific salmon based on data from DFO and the WSP, thus including vital information about the status of Pacific salmon conservation units. The introduction of the Salmon Appendix by Oceana Canada presented an exciting opportunity for our Ocean Wise team and enabled us to replicate the RAPSTA process for salmon CUs, which was previously unattainable.

Monterey Bay Aquarium's Seafood Watch

Considering it best practice, Ocean Wise uses the Seafood Watch Standard for assessing fisheries sustainability. To ensure the most precise and holistic assessment of salmon sustainability, including accounting for their complexities, Seafood Watch introduced the Salmonid Standard in 2017, since updated in 2020 (Seafood Watch, 2020). This standard, tailored for salmonids like Pacific salmon, is designed to incorporate a range of specific criteria that evaluate salmon conservation units. Leveraging the newly available data from the Salmon Appendix, we adapted the RAPSTA methodology outlined by Schiller and Renshaw (2023) by integrating the criteria specified in the Salmonid Standard. By combining the power of RAPSTA with the criteria developed for salmonids, we have achieved a more precise and comprehensive approach to assessing the sustainability of B.C. salmon.

Following typical RAPSTA methodology, we used the data from existing Seafood Watch assessments for B.C. Salmon to inform Bycatch and Habitat Impact scoring criterion (Criterion 2 and Criterion 4 respectively, see Appendix B, Figures B3, B5). Full Seafood Watch assessments supersede RAPSTA results when they cover the same CU or other geographic scale.

Pacific Salmon Foundation

The Pacific Salmon Foundation (PSF) stands as a key player in the conservation and sustainability efforts of British Columbia's salmon populations. As a non-profit organization, PSF is dedicated to safeguarding the future of Pacific salmon through various initiatives and research programs. Their work extends to various aspects of salmon conservation, including habitat restoration, monitoring, and the promotion of sustainable fisheries management practices. Open-

source data from PSF is available through their Salmon Explorer tool and was used to refine Salmon RAPSTA scoring. This innovative tool serves as a valuable resource for both researchers and the public, offering comprehensive information on the state of Pacific salmon populations, encompassing diverse aspects of salmon biology, habitat, and population dynamics. Most notably PSF data helped to inform the scoring for *Criterion 5: Hatchery Impacts.* PSF provides an estimation of enhancement level based on the release of hatchery-produced salmon in B.C. waterways. Characterization of enhancement is determined using a standardized approach and based on DFO methods of enhancement assessments (High, Moderate, Low, None, Not Assessed) for salmon CUs (PSF 2023; Table A1).

Table A1. Adapted from Pacific Salmon Foundation (2023), this table describes that level of enhancement from hatcheries of salmon runs.

Stream Enhancement Level	Definition
None	No records of enhancement
Low	No records of enhancement over the previous two generations
Moderate	Less than 25% enhancement over the previous two generations
High	More than 25% enhancement over the previous two generations
Not Assessed	The enhancement level for this Conservation Unit has not been assessed.

Table A2. The Salmon Advisory Panel members and their affiliations.

Name	Affiliation
Andy Olsen	Nuu-Chah-Nulth Seafood LP
Angela Addison	North Coast Skeena First Nations Stewardship Society
Dave Moore	Authentic Indigenous Seafoods Co-operative
Dr. Eric Hertz	Pacific Salmon Foundation
Greg Taylor	Watershed Watch Society
Dr. Scott Hinch	University of British Columbia

APPENDIX B: CRITERION SCORING

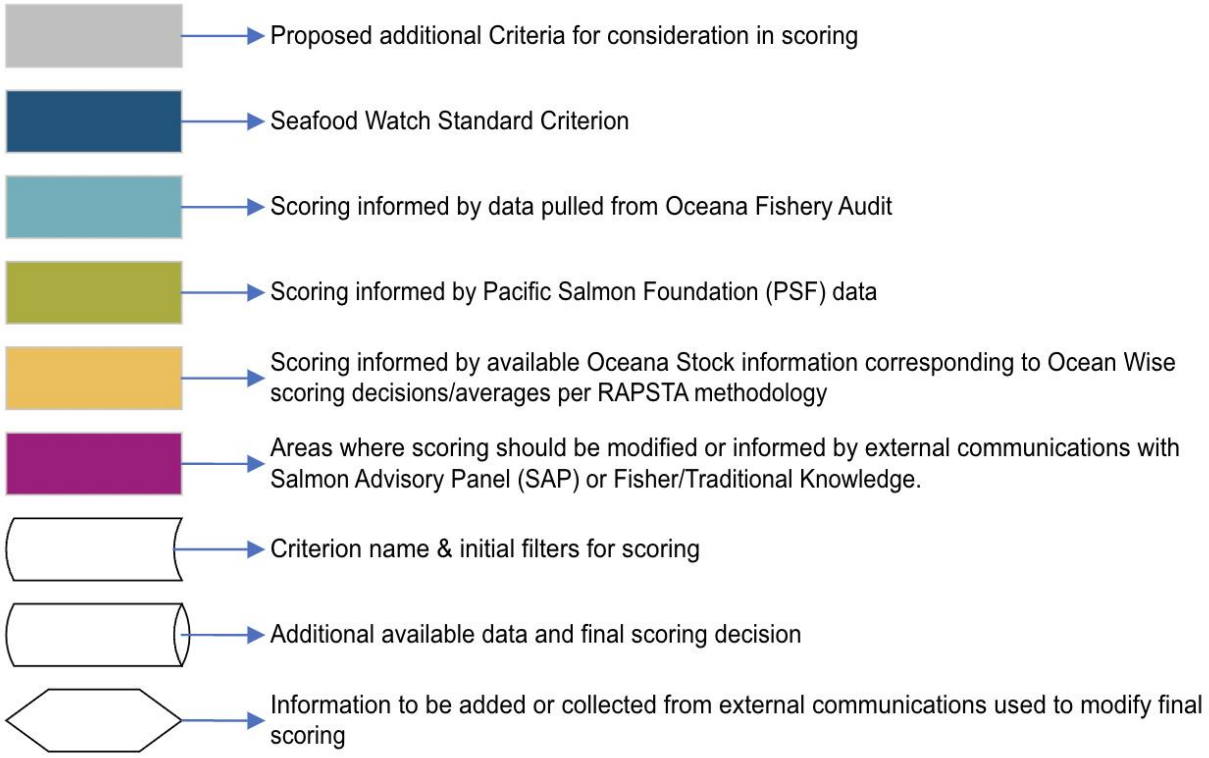

Figure B1. Legend for decision making flow charts.

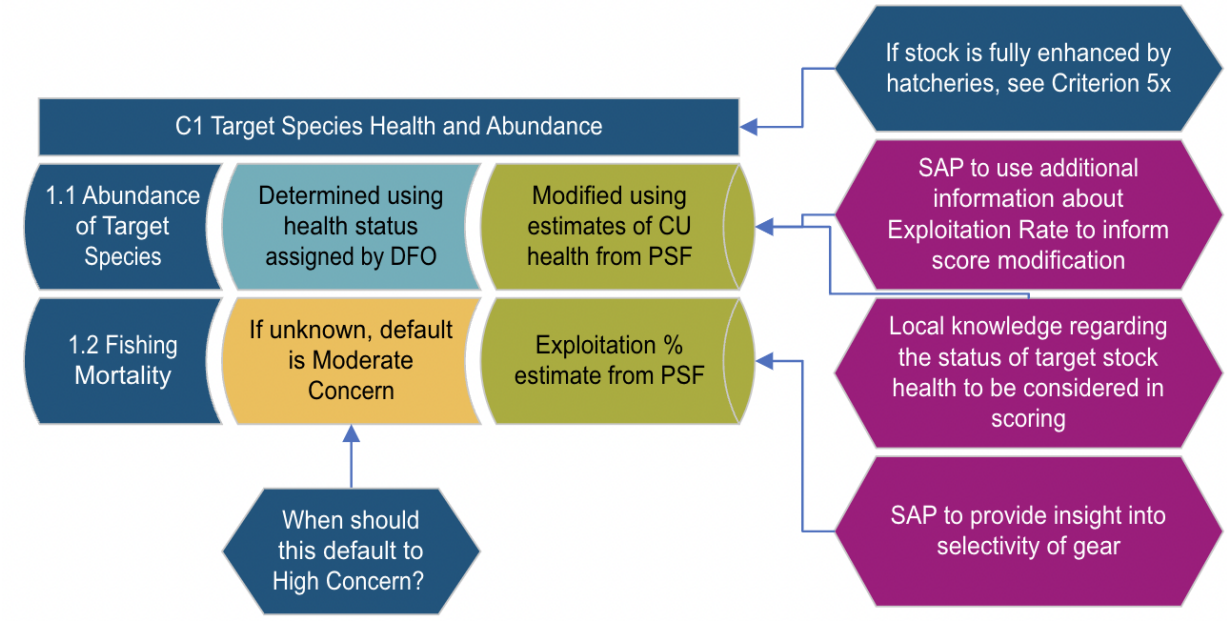

Figure B2. Scoring and decision-making process for Criterion 1.

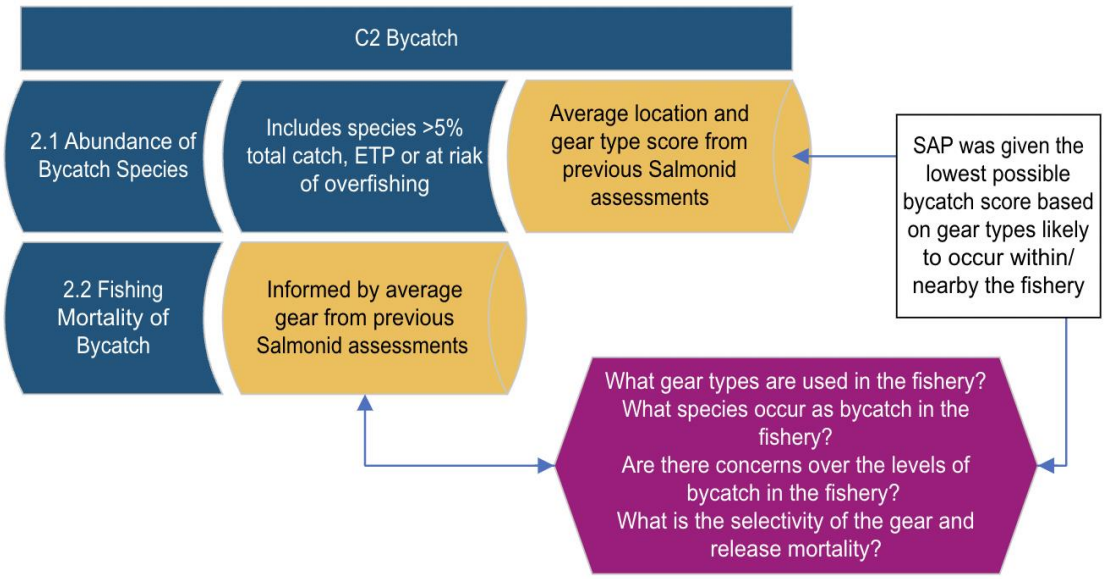

Figure B3. Scoring and decision-making process for Criterion 2.

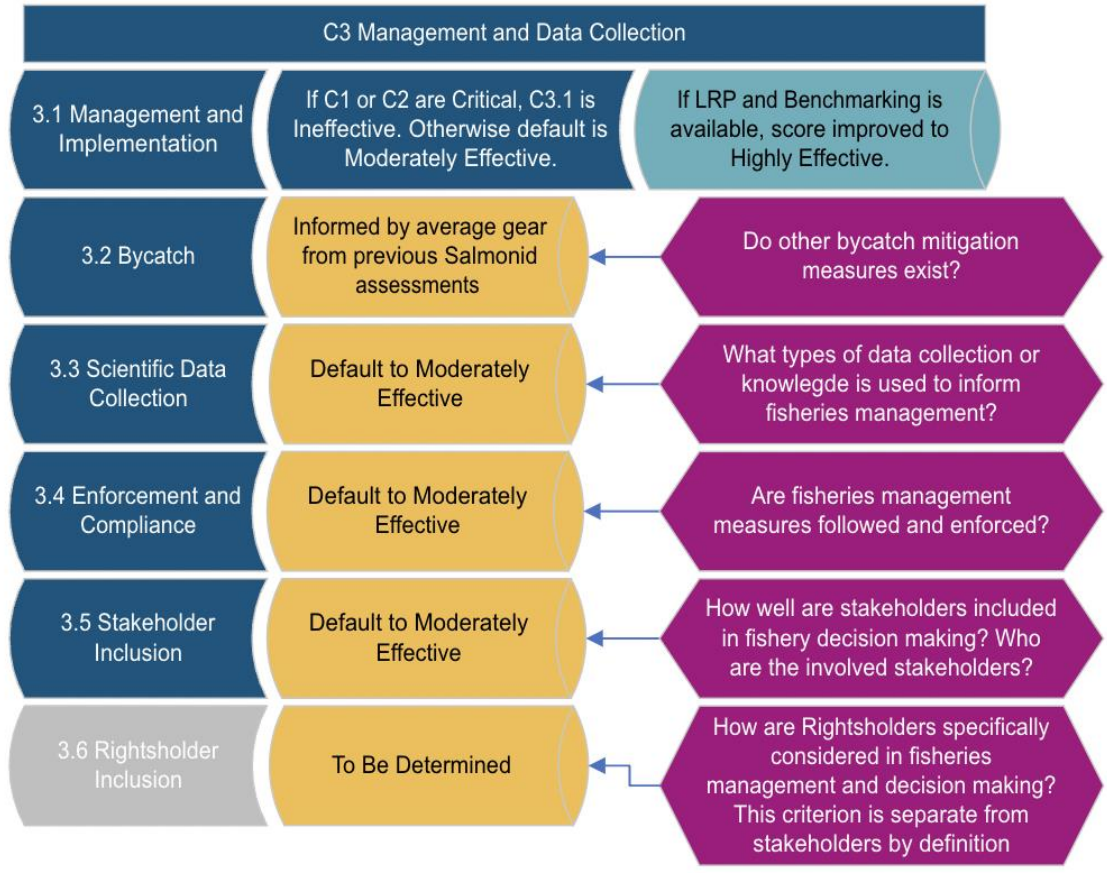

Figure B4. Scoring and decision-making process for Criterion 3.

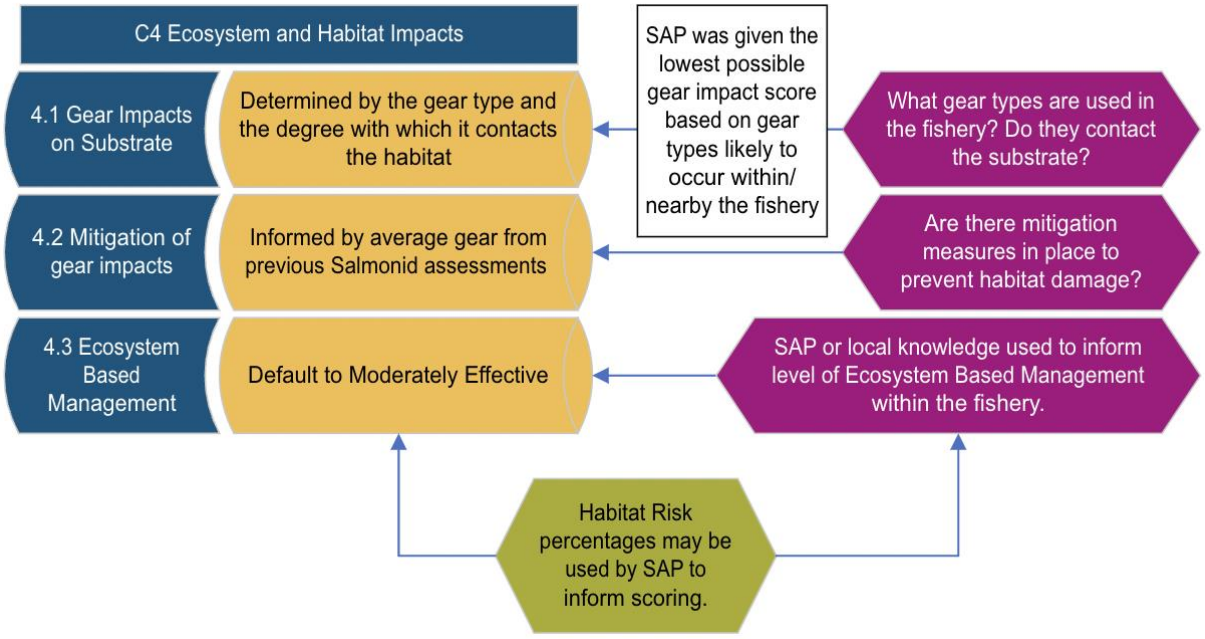

Figure B5. Scoring and decision-making process for Criterion 4.

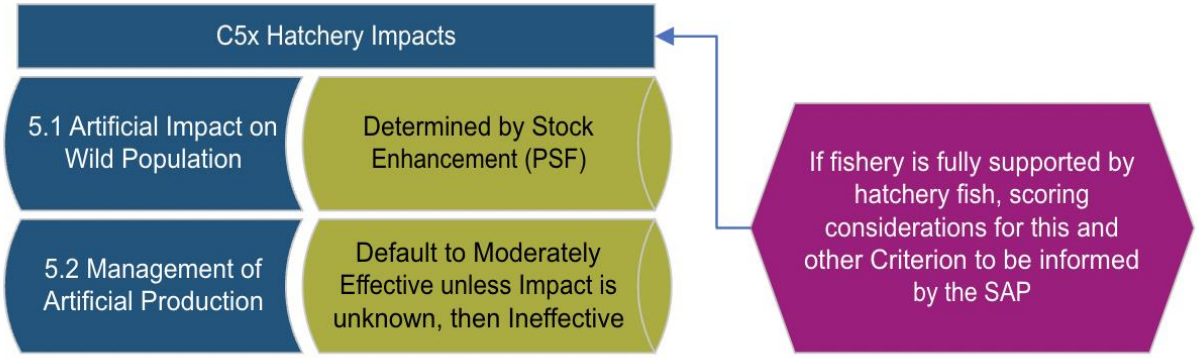

Figure B6. Scoring and decision-making process for Criterion 5x.

APPENDIX C: SCORING CALCULATIONS

Table C1. Overall scoring calculations (Seafood Watch 2020).

Scoring Options	Calculation
Without scoring for Criterion 5x (no impacts from artificial production)	Final Score = [geometric mean (Criterion 1, Criterion 2, Criterion 3, Criterion 4)]
With scoring for Criterion 5x (impact from artificial production)	Final Score = [geometric mean (Criterion 1, Criterion 2, Criterion 3, Criterion 4) X [(Criterion 5 score x 0.05) +0.75]