Quillback Rockfish Fishery and Conservation Objectives Workshop Summary Report

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Abstract

Haggarty, D.R., Siegle, M.R., Litt, M.A., and Huynh, Q. 2022. Quillback Rockfish Fishery and Conservation Objectives Workshop Summary Report. Can. Tech. Rep. Fish. Aquat. Sci. 3488: viii + 56 p.

Quillback Rockfish (*Sebastes maliger*) stocks were last assessed in 2011 and it was found that the inside (waters east of Vancouver Island) and outside (outer coastal waters of BC) Management Units (MUs) fell into the *Cautious* zone defined by the DFO Precautionary Approach. There was, however, considerable variation around the median biomass estimates, with the 95% confidence interval for both stocks encroaching into the *Critical* and *Healthy* zones. The uncertainty in stock biomass and consequently stock status make Quillback Rockfish an excellent candidate for further assessment under the Management Procedure (MP) framework developed for BC groundfish. To adhere with the best practices of the MP framework, we held a workshop series to bring together a group of Fisheries and Oceans Canada (DFO) scientists and managers, Indigenous representatives and knowledge-holders, commercial and public fishing representatives, non-governmental organizations (NGOs), and scientists. The specific goals for the workshops were:

1. To continue to build and strengthen relationships among the interested parties and begin soliciting input about the objectives and vision that participants have for Quillback Rockfish.

2. To arrive at a set of strategic and operational objectives to be evaluated in a Management Procedure Framework.

This report highlights the content presented at these workshops, held remotely on the *Zoom* online platform February 23-24, March 16 and March 30, 2021. Here, we summarize the workshop outcomes that should be considered as Quillback Rockfish are analyzed with the MP framework. We also note that online meetings offer several advantages in efficiency over in-person workshops.

Résumé

Haggarty, D.R., Siegle, M.R., Litt, M.A., and Huynh, Q. 2022. Quillback Rockfish Fishery and Conservation Objectives Workshop Summary Report. Can. Tech. Rep. Fish. Aquat. Sci. 3488: viii + 56 p.

Les stocks de sébaste à dos épineux (Sebastes maliger) ont été évalués pour la dernière fois en Colombie-Britannique en 2011 et les unités de gestion des eaux intérieures et des eaux extérieures se trouvaient alors dans la zone de prudence telle que définie dans l'approche de précaution du Canada en matière de pêche durable. Cependant, il y avait une variation considérable du côté des estimations de la biomasse médiane, l'intervalle de confiance de 95 % pour les deux stocks empiétant les zones critique et saine. L'incertitude entourant la biomasse des stocks et, du coup, l'état des stocks fait du sébaste à dos épineux un excellent candidat pour une évaluation plus poussée dans le contexte du cadre de procédures de gestion pour les stocks de poissons de fond de la Colombie-Britannique. Afin de suivre les pratiques exemplaires du cadre, nous avons tenu une série d'ateliers pour réunir un groupe de scientifiques et de gestionnaires de Pêches et Océans Canada (MPO), de représentants autochtones et de détenteurs du savoir, de représentants de la pêche commerciale et publique, d'organisations non gouvernementales (ONG) et de scientifiques. Les objectifs précis étaient les suivants :

1. Créer un contexte pour établir des relations entre les parties intéressées et commencer à solliciter des commentaires au sujet des objectifs et de la vision que les participants ont à l'égard du sébaste à dos épineux.

2. Élaborer un ensemble d'objectifs stratégiques et opérationnels à évaluer dans un cadre de procédures de gestion.

Ce rapport met en lumière le contenu présenté lors de ces ateliers tenus à distance sur la plateforme en ligne Zoom les 23 et 24 février ainsi que les 16 et 30 mars 2021. Nous résumons les résultats de l'atelier qu'il conviendrait d'examiner, sachant que le sébaste à dos épineux est analysé sous l'angle du cadre de procédures de gestion. Nous précisons également que les réunions en ligne offrent plusieurs avantages en termes d'efficacité par rapport aux ateliers en personne.

Acronyms

BC	British Columbia
B_{MSY}	Median Biomass at Maximum Sustainable Yield
B_{2011}	Median Biomass in 2011
BRP	Biomass Reference Point
CSAS	Canadian Science Advisory Secretariat
CV	Coefficient of Variation
DFO	Fisheries and Oceans Canada
FSC	Food, Social, and Ceremonial
LRP	Limit Reference Point
MP	Management Procedure
MPF	Management Procedure Framework
MPA	Marine Protected Area
MSE	Management Strategy Evaluation
OM	Operating Model
QB	Quillback Rockfish
RCA	Rockfish Conservation Area
SAR	Science Advisory Report
TAC	Total Allowable Catch
TRP	Target Reference Point
URP	Upper Reference Point

Introduction

Status of Quillback Rockfish

Quillback Rockfish (*Sebastes maliger; QB*) are commonly found on rocky reefs in the nearshore marine waters of British Columbia (BC) (DFO 2011). They are harvested in commercial, public, and First Nations' Food, Social, and Ceremonial fisheries. The Committee on the Status of Wildlife in Canada (COSEWIC) considers QB as a single coastwide Designatable Unit (DU). Fisheries and Oceans Canada (DFO), however, divides the coastwide DU into two Management Units for assessment: the inside stock, which inhabit the waters east of Vancouver Island in the Salish Sea and north through the Broughton Archipelago and Queen Charlotte Strait, and the outside stock, which encompasses the remainder of BC's coastal waters (Figure 1). In 2009, COSEWIC designated Quillback Rockfish as Threatened due to inherent life history factors (e.g., slow growth, late maturation, low productivity, episodic recruitment), as well as their capture in commercial, public, and Indigenous fisheries, and declines (of 50-75%) in catch since the mid-1980s, as observed in a suite of survey indices.

In 2011, a coastwide Stock Assessment and Recovery Potential Assessment was conducted to determine stock status relative to fishery reference points outlined under DFO's Precautionary Approach framework (DFO 2011). Future stock outcomes from a reference case Biomass Surplus Production (BSP) model allowed for QB stock recovery potential to be assessed under various fishery mortality harvest policies. Key findings from the 2011 stock assessment include estimates of median biomass, biomass thresholds relative to maximum sustainable yield (MSY), and fishing mortality estimates (Table 1).

The 2011 Stock Assessment and Recovery Potential Assessment found that both the inside and outside Management Units (MUs) fall in the *Cautious* zone, with values of the median 2011 biomass (B_{2011}) divided by biomass at MSY (B_{MSY}) falling between 0.4 and 0.8 (Figure 2). There is, however, considerable variation around the median biomass estimates, with the 95% confidence interval for both stocks encroaching into the *Critical* and *Healthy* zones where B_{2011} / B_{MSY} is less than 0.4 and greater than 0.8, respectively. The uncertainty in stock biomass and the inherent uncertainty in identifying precise reference points, as well as the conflicting stock status interpretations between the 2011 Stock Assessment and the declining abundance trends described in the COSEWIC (2009) Assessment, highlight that there are different perspectives on stock status and management needs.

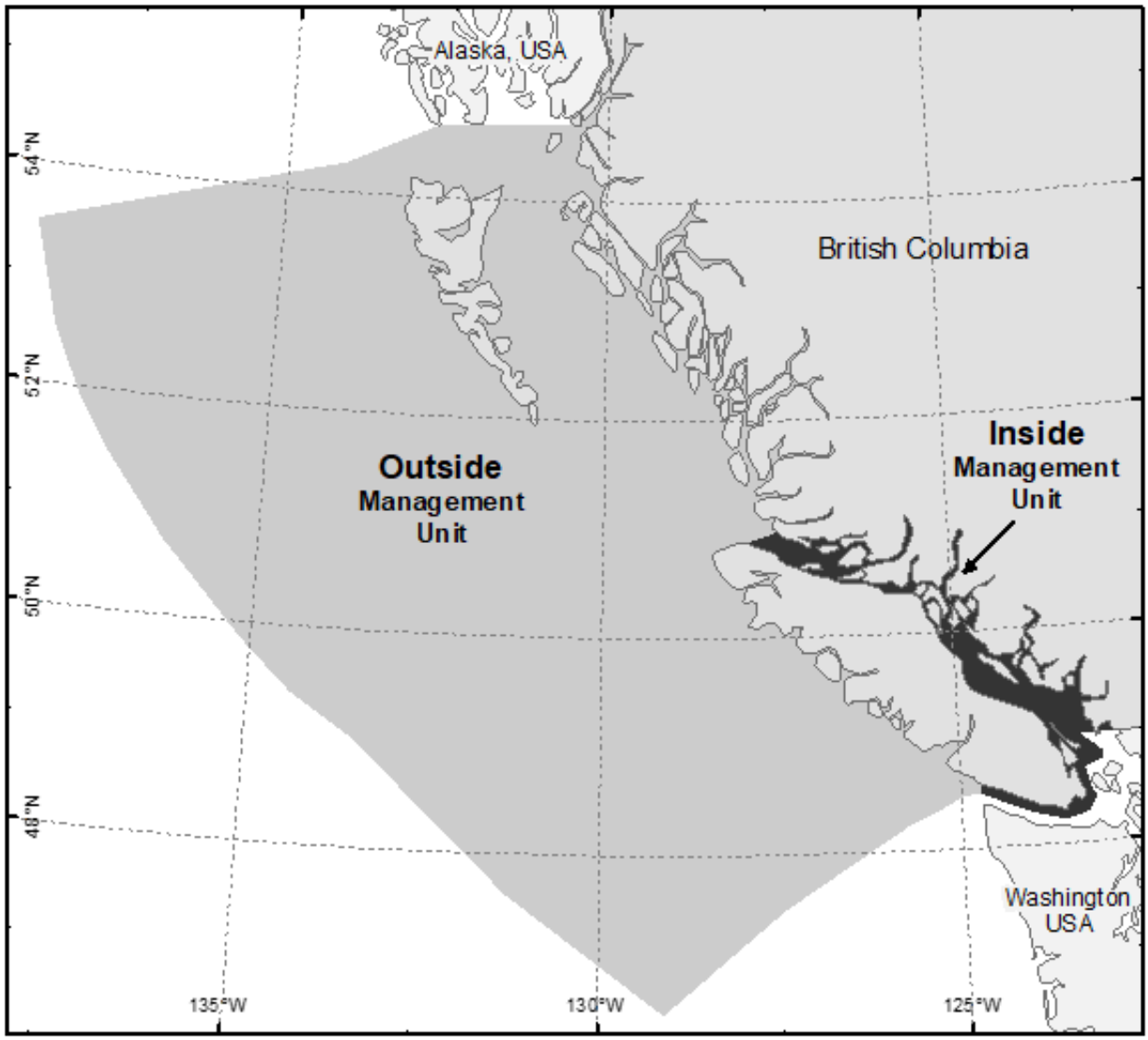

Figure 1. Map of Inside and Outside Quillback Rockfish Management Units on the Pacific coast of British Columbia.

Table 1. Key estimates from the 2011 Stock Assessment for Quillback Rockfish (Yamanaka et al. 2011).

Estimated factor	Outside	Inside
Median Biomass in 2011 (B_{2011})	6,480 tonnes (CV* 1.21)	2,668 tonnes (CV 0.60)
Median Biomass at Maximum Sustainable Yield (B_{msy})	9,307 tonnes (CV 0.60)	5,475 tonnes (CV 0.32)
B_{2011}/ B_{msy}	0.736 (CV 0.57)	0.493 (CV 0.41)
B_{2011} relative to 1918 Biomass	37.7% (CV 0.65)	27.4% (CV 0.47)
Generation Time	32.0 years	28.5 years
Fixed total fishery mortality at which there is a 95% probability of the population being >0.4 B_{msy} in 15 years	30 tonnes	-
Fixed total fishery mortality at which there is a 95% probability of the population being >0.4 B_{msy} in 90 years	90 tonnes	25 tonnes
Fixed total fishery mortality at which there is a 95% probability of the population being >0.8 B_{msy} in 90 years	60 tonnes	*Not expected to be achieved in 90 years with a harvest*
Total mortality from all fisheries in 2010	158.6 tonnes (116.5 commercial, 41.8 recreational, 0.3 salmon troll)	33.9 tonnes (24.8 commercial, 9.0 recreational, 0.1 salmon troll)

*CV = Coefficient of Variation

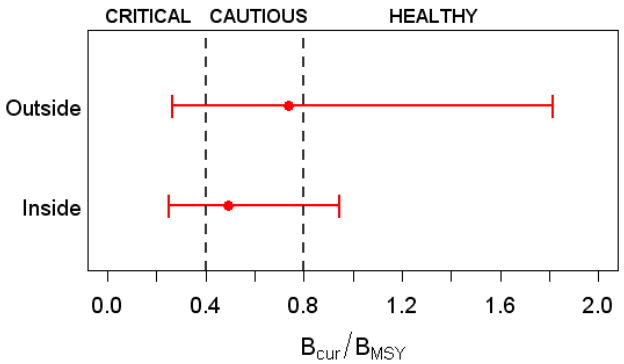

Figure 2. Quillback Rockfish stock status for the outside and inside management units in BC Consistent with DFO's Precautionary Approach and Fisheries Reference Points, stock status is presented as the median biomass in 2011 over the biomass at MSY with 95% confidence intervals (reproduced from Yamanaka et al. 2011).

Introduction to Management Strategy Evaluation / Management Procedure Framework

The Sustainable Fisheries Framework and the Fish Stocks Provisions of the *Fisheries Act* adopts a precautionary approach to ensure fish stocks are managed at sustainable levels (DFO 2021). This is done by identifying biomass targets and thresholds that are known as biomass reference points (BRPs). Specifically, fish stocks must be managed to be above the limit reference point (LRP), below which serious harm could occur to the stock. Identifying BRPs is challenging, especially for data-limited stocks without sufficient information to assess the degree of uncertainty in the stock assessment.

Management Strategy Evaluation (MSE) is a closed-loop simulation procedure that is increasingly being used to evaluate the effect of management procedures on fish stocks in situations where data is limited and the true state of nature is unknown. Closed-loop simulations are used to examine feedback between Management Procedures (MPs) and a simulation of the fish stock and its environment (known as the operating model – OM). An MSE process for groundfish in BC has been published as a DFO Science Advisory Report: Management Procedure (MP) framework for Groundfish in British Columbia (Anderson et al., 2021). Following the MP framework approach, DFO Science is able to recommend which Management Procedures have a high likelihood of meeting fishery and conservation objectives and are robust to varying sources of uncertainty. The MP framework follows these six steps:

1. Define the decision context;
2. Selection of objectives and performance measures;
3. Selection of uncertainties/specification of operating models;
4. Identification of candidate management procedures;
5. Simulation of the application of the management procedures; and
6. Presentation of results and selection of management procedure.

The success of different MPs in the closed-loop simulation, and their suitability for implementation in the real-world, is assessed against a set of management and fishery objectives using performance measures (PMs) identified in step two of the MP framework (Anderson et al. 2021). For a single stock, MPs are often evaluated in multiple OMs to account for various sources of uncertainty that cannot be accounted for within one OM. This process often reveals trade-offs between different objectives and a subset of MPs that can (hopefully) achieve successful outcomes.

Workshop Purpose

The DFO Inshore Rockfish and Lingcod Program is undertaking a MP Framework analysis for QB. Step two of the MP Framework specifies that development of objectives should involve managers, First Nations, stakeholders, and any other interested parties (Anderson et al. 2021). Furthermore, it indicates that the objectives may encapsulate biological, economic, social, and political considerations. The MP Framework acknowledges that different groups may value objectives differently and that trade-offs will be necessary.

To adhere with the best practices of the MP Framework, this workshop series brought together a group of Fisheries and Oceans Canada (DFO) scientists and managers, Indigenous representatives and knowledge-holders, commercial and public fishing representatives, NGOs, and scientists, with the specific goals of:

1. Creating an environment to build relationships among the interested parties and begin soliciting input about the objectives and vision participants have for Quillback Rockfish.
2. Arriving at a set of strategic and operational objectives to be evaluated in a Management Procedure Framework.

From the outset of the workshop series, it was acknowledged that these goals cannot be fully accomplished within three workshops. Relationship building with a diverse set of parties takes time, and the workshop leaders intend to continue the conversations that were initiated in this workshop series through CSAS peer-review processes and into the future. Similarly, developing the components of a Management Procedure Framework (e.g., objectives) is an iterative process for which the workshop series is just the first step. Further work will be conducted by a technical working group to refine objectives and develop performance measures.

Workshop Series Structure

To achieve the goals outlined above, three workshops were designed and carried out over four sessions:

- Workshop #1 focused on explaining the MP Framework evaluation process, clarifying the decision context for Quillback Rockfish, and identifying strategic objectives. Workshop 1 was divided into two sessions, held on Tuesday, February 23rd: 10:00 a.m. - 12:00 p.m. and Wednesday, February 24th: 9:00 a.m. - 11:00 a.m PST.
- Workshop #2 focused on further developing the strategic and operational objectives for the *Inside Quillback Rockfish stock* and was held on Tuesday, March 16th, 10 a.m. – 3 p.m. PST.

- Workshop #3 focused on further developing the strategic and operational objectives for the *Outside Quillback Rockfish stock* and was held on Tuesday, March 30th, 10 a.m. – 3 p.m. PST.

The list of workshop participants can be found in Appendix A, and the Workshop Agendas can be found in Appendix B. The Workshops were facilitated by ESSA Technologies Ltd. The technical discussions were supported by Dr. Quang Huynh (Blue Matter Science Ltd.) who will be conducting the MP framework analysis.

Each workshop session opened with a territorial honouring to highlight that participants joined from the traditional, ancestral, and occupied territories of some of the many First Nations in British Columbia. These territorial honourings served to remind participants of the linkages between work on Quillback stock assessments that will help contribute to greater efforts to recognize Indigenous rights and knowledge by ensuring fishery and conservation objectives include First Nations perspectives.

All workshop sessions took place as virtual meetings using the Zoom video communications software.

Workshop Goals

Workshop 1: Introduction to the Process

- Connect and continue building relationships;
- Discuss the decision-context for Quillback Rockfish;
- Gain an understanding of how the MP framework will evolve over time as discussions among the interested parties evolve;
- Develop strategic objectives for inside and outside Quillback Rockfish;
- Develop hypotheses to test different OMs and the robustness of different MPs;
- Better understand the long-term vision for Quillback Rockfish management among the participants.

Workshops 2 and 3: Inside and Outside Stocks

The original objectives for Workshop 2 and Workshop 3 were:

- To evaluate the operational set of objectives and performance measures for inside / outside Quillback Rockfish stocks, and trade-offs between them;
- To conduct an objective and performance measure prioritization exercise.

While many helpful considerations arose during Workshop 1, identifying operational objectives and performance measures required more relationship building and discussion time than was originally anticipated. As a result, Workshop 2 was scaled back from original plans to provide more time to discuss and clarify the operational objectives as a group.

Content Deemed to be out of Scope

At Workshop #1, there was some important feedback and discussion around several topics. For these topics, we have highlighted specific thoughts on forums and processes outside of this workshop series that will be better avenues for discussion.

The effects of the Rockfish Conservation Areas (RCAs) and Marine Protected Areas (MPAs) on Quillback Rockfish stock dynamics.

- A parallel CSAS process about RCAs is being held. The goal of this parallel process is to develop an RCA monitoring plan, and to work toward integrating that information into future stock assessments and Management Procedure Framework analyses.

Two-Eyed Seeing approaches and Indigenous Governance and Leadership

- Moving forward we hope to build processes with First Nations to use a Two-Eyed Seeing approach (e.g., Reid et al. 2021). We plan to hold a follow-up workshop with First Nations that were not able to attend these workshops. This will be a good place to get a better sense of who should be involved, who can review materials, and to seek suggestions about developing and sitting on Working Groups.

Identifying Limit Reference and Upper Stock Reference Points.

- The details of these reference points are better discussed in a Technical Working Group. These discussions will require looking over specific analyses and data.

Workshop Process

Workshop 1: Introduction to the Process

Following the opening welcome, land honouring, and overview of meeting considerations, a quick relationship building activity took place. In small breakout groups of 2-3 people, participants introduced themselves and explained what had brought them to the workshop. There were three rounds of this activity, which allowed participants to establish initial, face-to-face connections with other attendees. After the relationship-building activity was completed, Dr. Dana Haggarty of DFO's Inshore Rockfish and Lingcod Program provided an overview of the decision context for Quillback Rockfish (see ***Appendix D*** for presentation slides). Specifically, she addressed the following questions:

- ***Where are we?*** This section's content was similar to the information provided in the context section of this report.
- ***Where do we want to go?*** This section explained the need to be compliant with the Sustainable Fisheries Framework Precautionary Approach and the Fish Stock Provisions (e.g., maintain stock above the LRP and progress toward the healthy zone), but emphasized that the purpose of these workshops was to identify other relevant objectives.
- ***How do we get there?*** This section introduced the MP Framework as a means to find MPs with a high probability of achieving fishery and conservation objectives even if the stock status cannot be reliably estimated.
- ***How long will it take?*** It was emphasized that input was sought from workshop participants on the relevant timeframe and an appropriate assessment frequency.
- ***How will we know when we have arrived?*** Participants were reminded that stock assessment is an iterative process and that objectives can be updated over the long term based on continued monitoring, learning, and discussion.

Dr. Quang Huynh of Blue Matter Science Ltd. then introduced the MP Framework (see ***Appendix D*** for presentation slides). The introduction to MSE and the MP framework in the introduction of this report covers much of the material that was presented by Dr. Huynh.

Participants were then moved into smaller breakout groups of 6-7 people to brainstorm on the following guiding questions:

- What general goals and strategic objectives do you want to see put in place?
- How does this relate to what DFO has presented?

- Do you have any questions about how your goals or objectives fit into the MP Framework?

The breakout rooms began with introductions and a few minutes for silent generation of ideas. Participants spent the remainder of the breakout room time in an open discussion of everyone's thoughts.

Following a break, Dr. Haggarty explained the difference between strategic (i.e., high level goals) and operational objectives (i.e., quantified statements with a metric, probability of success, and time frame). Examples from the Inside Yelloweye Rockfish Rebuilding process were provided for illustrative purposes. Participants then reconvened in their small breakout groups to turn the general feedback and strategic objectives that were generated in their first breakout group session into operational objectives.

Session 2 Process Summary

After opening the meeting with the land acknowledgement, various points of confusion that had emerged during the first session were addressed, including:

- The respective roles of DFO, ESSA Technologies Ltd., and Blue Matter Science Ltd. in the process (as described in Section 0);
- that the surplus production model used in 2009 would not be used for the current stock assessment;
- that the Operating Models can be age-based;
- that the models will be updated with new data up to 2021.

A summary of Session 1 content was reviewed so that all participants were aware of what had been discussed in the different break-out groups. Dr. Huynh gave a short presentation on trade-offs in performance measures. Typical trade-offs that are encountered include biomass versus catch, long-term versus short-term catches, and variability in catch versus level of catch. This presentation set the stage for the first breakout group activity in which groups of 3 – 5 people discussed the commonalities, points of agreement, and points of disagreement among the set of draft strategic objectives (shown in Table 2). After a quick break, participants returned to breakout groups to discuss the following guiding questions:

- What should the timelines be for short-term objectives and long-term objectives?
- How certain do we need to be to know we have achieved an objective?

The workshop closed with a plenary discussion about the available, relevant data from 2011 onward. Much of the discussion focused on Anderson et al.'s (2019) reproducible data synopsis for BC groundfish.

Workshop 2: Inside Quillback Rockfish Stock

Prior to the workshop, a questionnaire was sent to participants to elicit their feedback and thoughts on six key topics that had emerged during Workshop 1. See ***Appendix C*** for a copy of this questionnaire.

After the opening welcome and land acknowledgement, participants were sent into three rounds of 1-on-1 breakout groups to introduce themselves and develop connections with other workshop participants. Following this, Dr. Haggarty addressed some topics that had been discussed in Workshop 1 and that are important, but will be better addressed through other avenues (see Introductory section "Content Deemed to be out of Scope").

Dr. Haggarty then led the group through a discussion of the differences between strategic and operational objectives, as well as the differences between objectives and performance measures. Examples from the Inside Yelloweye Rockfish Rebuilding process were provided. This primed the group for a breakout room activity in which groups of 5 – 6 people discussed the six key topics from the pre-workshop questionnaire and added their feedback and thoughts. All of the breakout groups' ideas were then merged and a plenary discussion was held to review the questions and content from each group.

Workshop 3: Outside Quillback Rockfish Stock

Similar to Workshop 2, a questionnaire was sent to participants to elicit their feedback and thoughts on key topics that had emerged during Workshop 1. For Workshop 3, only four key topics were identified - see ***Appendix C*** for a copy of this questionnaire.

After the opening welcome and land acknowledgement, participants were sent into two rounds of 1-on-1 breakout groups to introduce themselves and develop connections with other workshop participants. As in Workshop 2, Dr. Haggarty then addressed the topics from Workshop 1 that will be better addressed through other avenues (see Introductory section "Content Deemed to be out of Scope"). Next, participants were shown a short video that explains how management strategy evaluation works.

Dr. Haggarty then pre-emptively clarified some points that had been sources of confusion in Workshop 2. First, she clarified the meaning of the term 'catch' in the MP

Framework context, where it equates to the total fishing mortality and is therefore inclusive of all fisheries' Total Allowable Catches and daily limits for Quillback Rockfish. Second, she reviewed timelines of relevant activities relating to the Quillback science advisory process (see slides in ***Appendix D*** for the table of these timelines).

Finally, Dr. Haggarty led the group through a discussion of the differences between strategic and operational objectives, as well as the differences between objectives and performance measures. Examples from the Inside Yelloweye Rockfish Rebuilding process were provided. This primed the group for a breakout room activity in which groups of 5-6 people discussed the four key topics from the pre-workshop questionnaire and added their feedback and thoughts. All of the breakout groups' ideas were then merged and a plenary discussion was held to review the questions and content from each group.

Results

Workshop 1

Participants had many ideas for what they would like to see as general goals and strategic objectives relating to Quillback Rockfish. These ideas have been sorted and summarized in Table 2, along with some thoughts from the workshop lead (Dr. Dana Haggarty) and the technical lead (Dr. Quang Huynh) on possible ways to incorporate the ideas into the MP Framework.

Table 2. Strategic objectives and feedback from Workshop 1, Session 1 participants sorted into categories and accompanied by comments for capturing the ideas in the MP Framework.

Category	**Strategic Objective / Feedback**	**Possible ways to Capture in MP Framework**
MP Framework Modeling Considerations	Sustainable stocks into the future (ecosystem, economic, cultural, food security). * • Broad agreement on the need for this as well as agreement on timescale (sustained over many generations to come). • Consideration: sustainable can be defined in different ways.	Biomass and catch objectives.
	Maintain adequate and predictable fishing opportunities across all sectors. *	Catch objectives.

Category	Strategic Objective / Feedback	Possible ways to Capture in MP Framework
	• The definition of adequate and predictable may vary among groups.	
	Flexible MP approach that allows for more rapid assessment and inclusion of new data into management activities/responses. • To account for situations like what happened with Bocaccio (i.e., a year of abnormally high recruitment).	There are ways to address this in MP framework but we'll need to revisit this at a future date. • Consider responsive MPs, as well as OM scenarios with spasmodic recruitment and exceptional circumstances rules
	Accurate estimates of removals. • There was concern about weaknesses identified with iRec and creel surveys. • There were some concerns about accuracy of reporting across all sectors.	Uncertainties in levels of catch in Operating Models.
	Food, Social, and Ceremonial (FSC) fishery access in inlets • This fishery interacts with Quillback on small spatial scales – how can abundance be ensured at this scale? *	Scale of Management issue.
	Incorporate Rockfish Conservation Areas (RCAs) and Marine Protected Areas (MPAs) into stock dynamics. • How can displacement issues be accounted for?	Include an OM scenario for closed areas.
	Take action in "real-time" to address stock decline/increase.	Index-based MPs and updating of models.

Category	Strategic Objective / Feedback	Possible ways to Capture in MP Framework
	Explore non-Maximum Sustainable Yield (MSY) based reference points.	Objectives are reflected in the biomass performance measures. Tests for robustness to parameters that determine MSY, e.g., steepness (The biomass at MSY is implicitly calculated within the OM).
	Establish stock-specific reference points.	
	Manage for target reference points instead of limit reference points.	
	Spatial flexibility in fishing opportunity. • Need flexibility to move away from other species because Quillback catch is constrained by other species (i.e., need to avoid YE, halibut, lingcod). • How can depth be handled as a spatial issue? Quillback show depth selectivity by age/size selectivity and different fisheries target different ages/sizes.	Approach unclear – perhaps related to the scale of Management.
Process Objectives / Decision-context	Multi-species based objectives.* • Ecosystem-based management methods. • Incorporation of broader environmental data and environmental cues.	Approach unclear. Perhaps age and size be used as a proxy for broader ecosystem considerations (e.g., predator-prey dynamics, trophic levels).
	Indigenous governance / Two-Eyed Seeing (or other) approaches.	Possibly incorporated to corroborate OMs
	Align federal policies, meet Fish Stocks Provisions, COSEWIC and *Species at Risk Act* objectives.*	Outside of scope but clearly relevant to the decision context.
	Desire for better relationships between DFO and First Nations. • If Indigenous values are hard to translate into DFO models, there is a danger of not prioritizing or including them into considerations.	Continue Relationship Building. • Better reflection of Indigenous values in Management Plans.

Category	Strategic Objective / Feedback	Possible ways to Capture in MP Framework
		• More sincere engagement and relationship building with First Nations.
	General desire for better relationships between DFO and all sectors as well as between sectors.	Continue Relationship Building.
Other Research	What is the efficacy of descending devices to reduce mortality?	Management issue but could test with robustness scenario of reduced mortality.
	What is the effectiveness of Rockfish Conservation Areas?	Monitoring and research on this will eventually feed into closed area scenarios.
	Proactive instead of reactive approach (habitat creation, reef building).	Outside of MP Framework but work is happening with Marine Conservation Targets, RCAs, and sponge reefs.
	Explore methods to study alternative spatial distributions of Quillback.	Approach unclear.
Value of Information	Strive for age-structured data-rich assessments. *	Eventually incorporate into OMs. Use age-structured operating models.
	Collect biological samples from fisheries.	

*multiple groups provided this objective/feedback

Participants provided clarity on the timelines for many of the objectives that had been identified in Session 1. These thoughts have been sorted and summarized in Table 3.

Table 3. Working objectives (based on Session 1 outcomes) and associated timelines, as identified by breakout groups in Session 2.

Objective	Timelines

Sustainable stocks into the future in terms of ecosystem value.	Long term. • Currently have this, but need to consider how to maintain for the long term.
Sustainable stocks into the future in terms of economic value.	Long term.
Sustainable stocks into the future in terms of cultural value.	Many human generations.
Sustainable stocks into the future in terms of food security.	An immediate concern about food security. • There is a need to switch to other food sources to account for less Sockeye.
Improved estimates of removals.	Short term requirement.
Update on stock assessment.	Short term requirement.
Maintain predictable fishing opportunities across all sectors.	Requires ongoing diligence in monitoring and addressing stock dynamics.
Reference points - maintain stock above LRP.	1.5 - 2 generations (Precautionary Approach policy). • Generation time for outside Quillback being 32 years and for inside Quillback being 28.5 years). **Certainty:** high probability (75- 95%) - consistent with Precautionary Approach.
Rebuild the stock if it is below the LRP.	Determined by Fish Stocks Provisions with current guidance 1.5 to 2 generations.
Stability in catch over all sectors. • How is stability defined? Is it minimum catch or based on inter-annual variability?	
Do we need an Upper Stock Reference (USR) or Target Reference Point (TRP)?	

• Fish Stocks Provisions require TRP, but the USR can be the TRP.	
Maximize annual catch. • Optimize annual catch within MSE process.	Shorter-time frame (4-14 years?). • Will need to develop performance metrics and consider the trade-offs for this.

The following bullet points are the initial responses from the workshop lead (Dr. Dana Haggarty) and the technical lead (Dr. Quang Huynh) to the discussions from Session 2.

Stock Assessments in general

- Some groups still struggle to buy into stock assessments. DFO might need to put more effort into communicating that they are trying to find better methods to acknowledge and incorporate uncertainties.
- Stock assessments are trying to do a reconstruction of what happened in the past, but they cannot predict a spasmodic recruitment if this has not been encountered before. The MP Framework will allow us to simulate more "what if" scenarios. Therefore, spasmodic recruitment can be tested but it will still require an understanding of appropriate performance measures to evaluate how well objectives are being met.

Reference Points

- Reference points - maintain stock above LRP with very high probability.
- PMs might change if the stock is below the LRP (and therefore requires a rebuilding plan) as opposed to being in the healthy range. An approach for addressing stock status dependence of objectives and PMs needs to be considered.
- Once the LRP performance measure has been met, we can consider other objectives (catch).
- Do we need an Upper Stock Reference (USR) or Target Reference Point (TRP)?
- Do we need a control rule between the LRP and USR?

Specific Objectives

- There is a need for definitions of words like *stable* and *predictable*, as well as for spatial delineations.
- The scale of analysis will need to be discussed for outside Quillback Rockfish – should it be assessed as a single stock or split into north and south management units as with outside Yelloweye Rockfish (Cox et al. 2020)?

Other Considerations

- Commercial fishers targeting Quillback Rockfish want medium-sized fish and therefore must move around to find them and to avoid other species (e.g., Yelloweye Rockfish, Pacific Halibut).
- Objectives are seen as hierarchical.
- Depletion-based performance measures may be a better way to capture the COSEWIC perspective.
- Clarification - ecosystem-based management does not mean some species will be overfished while conserving others.

Workshops 2 and 3

For each of the six key topics, the breakout room content and discussion notes from the plenary sessions from each workshop (Inside and Outside) are summarized below:

1. ***How do we focus "adequate and predictable" access into operational objectives?*** In what situations do we need to consider flexibility over predictability in catch (or TAC)? In what scenarios do we need to increase or decrease the Total Allowable Catch (TAC)? How do we implement "real-time" activities with regards to addressing stock increases or declines? How often should we update the TAC (and what is feasible given monitoring timeframes and data processing)?
INSIDE STOCK ***Do not let catch go any lower than the current limit.*** • Representatives from the Sport Fishery Advisory Board advised that they do not want to see the recreational fishery go to zero retention for Inside Quillback. An

increase in the aggregate rockfish catch per day would be welcomed, but at a minimum the status quo should be maintained.

- A scenario with a catch floor for commercial and recreational catch should be run as part of an operating model in the MP framework analyses. This would ensure a predictable catch from year to year, however, there may be trade-offs with conservation objectives.

Stability and predictability are valued over flexibility by both the commercial and sport fisheries.

Perspectives on the timelines for updating the TAC varied:

Frequent updates are preferred to reduce risk of having to move to bigger management actions, like major drops in TAC or shortened seasons. Smaller frequent changes are better than less frequent, big changes.

- Suggested timeframes for TAC updates ranged from 2 – 7 years.
    - The MP could update the TAC after every survey so if the stock is subdivided into smaller areas, then perhaps things could be updated more than every two years because there would be no need to wait for the full survey to be completed.
    - One suggested timeframe was every seven years, based on when commercial fishers start to see changes in response to management. This also corresponds to some important biological traits of Quillback (e.g., maturity).
    - Seven years may be too frequent given that a new cohort would only start to be caught in surveys at seven years of age.

The timeframe for looking at objectives related to the USR point and the healthy zone is longer.

- To be consistent with the Precautionary Approach policy, this would be 1.5 – 3 generations.
- The risk tolerance needs to be determined and attached to MPs as a performance measure.

OUTSIDE STOCK

The fish stocks themselves are not predictable for more than a few years ahead, but the ***response to changes in fish stocks can be planned and predictable***.

- Responses to high or low recruitment should be planned ahead of time.

Feedback from commercial fishers is needed on:

- The preference for splitting Quillback from other Rockfish or aggregating it with Tiger, Copper, and China Rockfish.
    - Whether Quillback quota affects the ability to execute Halibut fisheries.

A ***fixed catch rate is desirable*** (i.e., minimize inter-annual variation), however flexibility should be possible after large recruitment events (e.g., as in the case of Bocaccio).

- A stable minimum catch rate across multiple fisheries may be challenging to achieve.
    - A catch floor could be used as a performance measure in simulations, however this complicates the interaction between the population and management actions.

Spatial flexibility is desirable.

- There should be coordination of the fishing fleet to prevent overfishing in one area.
    - This allows for closures in different sectors depending on the time of the year.
- Commercial and public catch data from 2020 (and perhaps 2021) will not be representative of long-term trends due to the effects of Covid-19 and therefore should be excluded from PMs.

2. What are the Quillback catch needs to support other fisheries?

- What level of Quillback TAC is needed for commercial, recreational, and Food, Social, and Ceremonial fisheries?
- What Quillback TAC considerations are needed for different fleets (e.g., Halibut fleet needs “X” Quillback TAC; lingcod needs “Y” Quillback TAC), and likewise are there other fisheries that limit the Quillback fishery (Lingcod, Yelloweye, other)?
- For Food, Social, Ceremonial fishers, are Quillback targeted? Or, are they taken opportunistically but not targeted?
- Are recreational fishers targeting Quillback? Are they not targeted but taken opportunistically? How often are descending devices used on Quillback?

INSIDE STOCK

Minimize the probability that TAC drops below current level should be a priority.

- The current allowable TAC for commercial fisheries in ZN is adequate.

- Sport fisheries would not like to see Quillback retention go to zero because of economic opportunity for catching rockfish while targeting other species. Ideally, retention would be increased to two per day for combined rockfish. A longer time frame for rebuilding/growth is preferable in order to maintain fishing opportunity. In other words, stability should be prioritized.
- In developing a catch objective for this, the TAC could be bracketed upward and downward to examine possible harvest control rules.
- An objective could be to maintain a minimum level of catch. The frequency of going below the minimum TAC could be measured and the effects on the conservation objective could be examined.

The commercial fishery would like a ***higher Lingcod quota*** when executing the Quillback fishery.

- Inside Lingcod are increasing, making it harder to fish for Quillback due to low quotas (400 lb trip limit for commercial fishery). Commercial fishers have to work to avoid catching Lingcod. Lingcod also prey on Quillback and reduce the Quillback fish quality.

Incidental catch must somehow be considered.

- Quillback are not targeted in the FSC fishery but are kept when caught. A-tlegay Fisheries Society retains catch information.
- Quillback are also incidentally caught in recreational fisheries.

The ***effect of descending devices*** on available catch should be accounted for in simulations via the sensitivity analysis.

Some needs relating to this question include:

- Better fish identification for data purposes.
- Research on the effectiveness of descending devices.
- Improved sharing of FSC data.

OUTSIDE STOCK

Recreational fishery users on the north coast would like to ***increase daily catch limits*** for at least a subset of the species in the current aggregate.

- An increase to a daily limit to 5 rockfish (from 3) was suggested. Discussing this directly with North coast sport fishers would provide more clarity.
- Quillback may be slightly more targeted now that there is zero retention of Yelloweye, however Quillback catch remains largely incidental.

Ideally, the recreational fishery would have the flexibility to ***remove Quillback from aggregate daily limits***.

Timing is also an important consideration for the sport fishery because there is a seasonal aspect to the specific locations that are targeted.

Quillback are a ***common catch in FSC fisheries*** despite not being heavily targeted.

Maa-Nulth treaty domestic fishery catch is affected when commercial TAC drops for any of the 5 inshore species.

More ***accurate, species-level sampling data*** would be beneficial:

- Creel surveys could be collecting whatever information is needed – the Groundfish Coordinator may help with discussions about optimizing recreational creel surveys.
- iRec data at the species level are available, but there are concerns about species identification accuracy.
- The Haida record at the species level.

3. ***What are objectives you would like to see regarding size and age structure?***
   - Have age and size of catch across sectors changed over time from what you used to catch?
   - Are perceived changes in size or age due to abundance vs. other factors (e.g., market demand)?
   - Are certain sizes preferably selected or what sizes are generally caught in the fishery you have experience with?

INSIDE STOCK

Objectives related to this stock may be ***distorted by catch and recruitment patterns***. For example, does mean size decrease due to large recruitment or depletion of older fish?

Age and size objectives may be captured as ***outcomes of other objectives***.

- For example, the models can examine changes in relative size as other biomass objectives are met. Given two MPs that meet conservation objectives, one may also increase body size, but a quantitative metric for this must be developed.

OMs can also compare the age structure in the population with what is caught in different sectors.

Could an objective be created to ***protect peak fecundity***?

- Protecting biomass means increasing fecundity through the number of larvae released.

OUTSIDE STOCK

(not addressed directly)

4. ***Do you have any solutions for obtaining biological samples for size and age from fisheries?***

INSIDE STOCK

The reasoning behind this question is that long-lived species should not be assessed with a surplus production model.

The commercial fishery is predominantly for a live fish market, so it is challenging to collect samples.

Work could be conducted with the Sport Fishery Advisory Board to collect samples. For example, the Sablefish fishery uses a head collection program and something similar could be done for Quillback.

Before taking any steps, the value of more age data in simulations should be assessed because there is a cost to collection and storage.

The capacity for ageing (i.e., the Pacific Biological Station Age Lab) may limit the number of samples.

OUTSIDE STOCK

(not addressed directly)

5. ***Is a separate north and south analysis necessary for either stock?***

- What could be happening in different geographic areas that would warrant spatially distinct analyses?
- What are the objectives among Indigenous fishers regarding spatial scale?

INSIDE STOCK

There is interest in ***finer scale analyses*** due to habitat and ecological differences in area 12.

- Four potential areas that were suggested are: 1) Telegraph Cove to boundary with area 11, 2) Telegraph Cove to Campbell River, 3) Campbell River to Gulf Islands, 4) Gulf Islands to outside waters.

- Finer scale analyses may be warranted because:
  - There are areas of hot and cold spots that can withstand more or less harvest.
  - Different fisheries are confined to different areas.
  - There are effects from RCAs.
  - First Nations would like to know more about sustainable harvest in their territories.
- Uncertainty must be considered when focusing on finer spatial scales – what can actually be determined at this scale?
- 4B is the realistic management area that can be used for this question. However, the survey does not cover all of 4B.

If the areas are biologically connected, ***one larger analysis*** may be more appropriate. Is there a biological reason to move to a finer scale? Are there data to support this type of stock division?

- Biomass trend information may help inform the decision to split or leave as one analysis.
- Reporting will have to be rolled up into one population/stock.

Other potentially relevant information on ***spatial differences***:

- There is little catch south of Campbell River and most good spots are in RCAs.
- Most commercial catch is in the north of the inside area, where fish recruit to these areas from the outside coastal waters as well. There are seasonal differences in the commercial fishery – the south is too warm for a live fishery except in the winter.

OUTSIDE STOCK

A ***finer spatial resolution*** could:

- Reflect hot and cold spots that describe areas with relatively higher and lower catch rates, respectively.
- Ensure the necessary minimal catch rate needed for FSC and public fisheries.
- Capture the spatial variability in biological factors (e.g., growth rates, genetics) that is observed in data.

There is ongoing work at CCIRA to obtain specific catch objectives for rockfish for the Central Coast Nations.

6. ***Managing for Upper Stock Reference (USR) Point and Limit Reference Point (LRP), and working in non MSY-based paradigms.***
   - How can we create objectives to work within both the MSY paradigm and a depletion-based paradigm?

For the USR:

- How much certainty should there be for achieving the USR (level of probability)?
- What timeframe should be set for achieving the USR (i.e., number of generations)?

INSIDE STOCK

It is difficult to identify the best objectives without having ***more information from the current modeling***.

- A 'no fishing' scenario will help set the boundaries of what is feasible. This scenario will help with identifying what could be achieved biologically, an appropriate time frame, and the level of risk tolerance. This scenario would be worth reporting back to participants so that further objectives could be discussed.
- A 'current mortality' scenario and the 'no fishing' scenario will be the reference MPs.

Perception of the stock will change based on use of age-structured models as opposed to the previous surplus production models – they will use different production functions.

MSY-based reference points are a focus in the PA framework, they are not prescribed, and may or may not reflect what this group wants.

- There are uncertainties on how what constitutes "healthy" and how the USR should be defined. Fish management will decide the level of risk taken with this.
- The USR may be a 'best case' scenario that is not reasonable within one generation time.

OUTSIDE STOCK

The ***Precautionary Approach policy does not require MSY-based reference points***.

- It simply recommends that 0.4 and 0.8 of B_{msy} should be used in absence of alternatives.
  - A B_{msy} multiplier (e.g., 1 or 1.2) is another option.
- Other paradigms (e.g., historical biomass, depletion-based) can be used.
- The data may indicate what is most appropriate to use for reference points.

A parallel process assessing ***longer-term, broader ecological goals*** would be useful.

- Although measuring broader ecological goals can be challenging, the capacity is available within and outside DFO to collect the necessary data as long as there is a mandate to drive the work.
- There is a risk of delaying decisions due to delays with getting data for ecological PMs. Doing this as a parallel process rather than immediately replacing stock assessments is a safe way to move forward.
- The Pacific Herring MSE process may be a possible model for incorporating ecological considerations and objectives.

Biomass objectives do not manage for ***size and age structure***.

- Non-stationarity and size-at-age can be incorporated into OMs. These can be affected by fishing or recruitment.
    - It would be helpful to have additional size-at-age data.
    - Ongoing capacity challenges in the Sclerochronology Lab will affect the ability to produce additional size-at-age data, at least in the near-term.
- Success should be defined as moving above the USR.
- USR can be problematic – how is “healthy” defined as a stock transitions from the cautious zone to healthy zone?
- Confidence levels are important to consider. Managing toward the USR with high confidence might be appropriate. Alternatively, managing to be above the LRP with very high confidence could also work to ensure a high biomass.

Discussion

Workshop Key Outcomes

The key findings from across all workshop sessions have been summarized below in three categories: 1. Key considerations for the upcoming MP framework analysis for QB, 2. Other broad findings that emerged during the workshop series, and 3. Actionable next steps.

Key Considerations for the Stock Assessment

- There was broad agreement that *stocks should be ecologically, economically, and culturally sustainable and allow for food security* over many generations to come.
- An objective that *ensures catch in the recreational fisheries does not drop below current levels* (from 1 rockfish to 0 rockfish) should be a priority to ensure that there are fishing opportunities for the public.
- For the Outside stock, recreational fishery users on the north coast would like to *increase daily catch limits* for at least a subset of the species in the current inshore rockfish complex.
- Ideally, the recreational fishery would have the flexibility to *remove Quillback from rockfish aggregate daily limits*.
- *Frequent updates to the MP framework are preferred* to reduce the risk of having to move to bigger management action (such as major drops in TAC for the commercial sector, shortened fishing seasons, or non-retention allowed in public fisheries). Smaller, more frequent management changes in order to meet conservation objectives would be better received.
- *Concern over the accuracy of removal estimates should be incorporated* into the model uncertainties.
- *Spatial flexibility in fishing opportunity is necessary.*
- *Examine the effectiveness of RCAs and MPAs with an OM scenario for closed areas.*
- An outstanding question from the workshops is: *what reference points are most appropriate?*
    - There is interest in non-MSY based reference points.
    - There is interest in managing to the USR not the LRP.
    - See ‘Next Steps’ for more on how to address questions regarding reference points.
- Explore an objective that *protects peak fecundity*.

- *There needs to be a biological reason to conduct analyses* on a finer spatial resolution.
    - If there is a biological reason to conduct a finer scale of analysis for the Inside stock, then there is appetite and interest in this approach.
    - A finer scale analysis may be worthwhile for the Outside stock since there appears to be spatial variation in biological factors within this region.
    - FSC fisheries operate on a smaller spatial scale concurrent with respective territories, and it is important to consider how abundance can be ensured on this scale.

Other Considerations

- *Some groups still struggle to buy into the results of stock assessments.* Improved communication on methods, uncertainties, and findings of stock assessments is needed.
- *There is interest in ecosystem-based and multi-species management.*
    - A parallel process assessing longer-term, broader ecological goals would be useful.
- *There is a general desire for better relationships and engagement between DFO, all sectors, and Indigenous groups.*
- The commercial fishery believes *a higher Lingcod quota would be beneficial* when executing the Quillback fishery.

Potential Next Steps

- *Continue relationship-building across all sectors.*
- *Identify management responses and the resultant outcomes of those actions in response to high or low recruitment scenarios ahead of time.* Disseminating these responses to participants for their feedback may be a useful exercise.
- *Obtain feedback from commercial fishers* on:
    - Whether Quillback are a pinch-point for Halibut fisheries.
- *Work to obtain more accurate, species-level data.*
    - *Improve accuracy and otherwise optimize the value of data from iRec and creel surveys.*
    - *Develop methods to support data sharing with FSC fisheries*

    - *Explore the value of age data, and if useful, consider ways to collect biological samples from the fisheries. For instance, consider whether a head collection program, similar to what was done with the Sablefish fishery, would be feasible in some of the non-live fisheries.*
        - *This recommendation may rely on increasing capacity at the Pacific Biological Station's Aging lab, unless these samples are prioritized.*
- *Research the effectiveness of descending devices.*
- *Discuss objectives for daily limits with north coast recreational fishery members (Outside stock).*
    - Discuss a possible preference for splitting Quillback from other rockfish or aggregating it with Tiger, Copper, and China Rockfish with recreational fishers.
- *Conduct 'current mortality' and 'no fishing' scenarios to use as reference MPs* and to help determine what is feasible in terms of reference points (i.e., what could be achieved biologically, what time frame is appropriate, and the level of risk tolerance). Report the findings from this MP analysis back to workshop participants so further objectives can be discussed with better knowledge of the context.
- *Run a scenario with a catch floor for commercial and sport catch as a PM and determine how this trades off with conservation objectives.* Report the findings from this back to workshop participants for feedback.
- *Work with Indigenous groups to better to better inform current management and build collaborative processes.*

Additional Process Considerations and Resources

The Covid-19 pandemic forced a world-wide "work from home" experiment, which fundamentally changed the way the majority of us held discussions and participated in workshops. It forced many of us to rewrite the methods used to structure workshop conversations. Despite virtual meetings and workshops being relatively rarely used by the project lead, virtual facilitation was not unfamiliar to ESSA Technologies, who was able to bring a virtual facilitation toolkit to help design and facilitate this workshop process.

Given the uniqueness of the last year and the promising future that virtual meetings and virtual facilitation has, even as we move into a post-Covid world, the Project Lead wanted

to capture some insights from the use of virtual facilitation in a MSE process context, which may provide guidance for others embarking down similar roads[4].

MSE processes, including the MP framework for groundfish, are inherently iterative. Fishery and conservation objectives help shape harvest control rules and the selection of Management Procedures, which then feeds back and influences stock dynamics. The fishery and conservation objectives may change over time in response to the success (or failure) of the Management Procedure (MP) to achieve the objectives as measured by a set of performance measures. As such, there is a need to regularly check-in with the participant group to update them on the status of the MP and its ability to meet the fishery and conservation objectives, and to discuss the possibility of updating the objectives and performance measures.

Zoom or other virtual meetings are an effective way to bring people together to have these discussions. In-person meetings are often expensive, time-consuming, and can be difficult to schedule given the limited availability across many participants. Virtual meetings provide a means to gather without needing the time and financial resources for traveling. Additionally, virtual meetings also allow for the project team and participants to make use of asynchronous time – time spent on the process in between times we are gathered together. Often at in-person meetings, participants have limited time during breaks or over lunch (or during the evening before the second day of the meeting begins) to process the content presented and discussions in which they have participated. Virtual meetings, however, can be designed to effectively use both synchronous and asynchronous time. Time spent preparing outside of the meeting time entails the time in which we are together can be spent in discussion. The Project Lead also found that small group, breakout conversations in the virtual meetings were effective, possibly even more so than breakout discussions at in-person meetings.

The project lead and facilitators approached this project as a collaboration. Having an experienced virtual facilitator to lead the workshops can be highly beneficial for ensuring a smooth process. Project leads should be prepared to invest a significant amount of time in co-designing the workshop process. The content needs to be shaped by the project lead, and ongoing dialogue between the project lead and facilitator is essential so the *process* design works towards the *purpose*. It is important to keep in mind that workshops are significant time investments for participants, and it should be clear what is asked of participants and what benefits they will gain.

[4] *Disclaimer: The ESSA authors of this report are aware of the conflict of interest in writing about the benefits of virtual facilitation, a service they offer as a company. This section of the report was initiated and reviewed by the DFO Project Lead.*

Acknowledgments

ESSA Technologies Ltd. is headquartered on the traditional, ancestral, and occupied shared territories of the xʷməθkʷəy̓əm (Musqueam), Skwxwú7mesh (Squamish) and səl̓ilwətaʔɬ təməxʷ (Tsleil-Waututh) Peoples. The ESSA International office is located on the traditional, ancestral, and occupied territory of the Algonquin Anishinaabe People, in Ottawa, Ontario. The workshop participants come from a number of different Indigenous territories, including those above. The additional ancestral and occupied territories of our workshop participants include the Kwakwaka'wakw, K'omoks, Nuu-chah-nulth, Snuneymuxw, Tla-o-qui-aht, Mi'Kma'ki, K'omoks, We Wai Kai, We Wai Kum, and Homalco territories. The authors would like to acknowledge and thank the curators of *native-land.ca* for providing resources that helped guide us in developing our territorial acknowledgements and honourings that opened our meetings. We also acknowledge Chelsea Vowel, for her essay titled *Beyond territorial acknowledgements*[5], and for the teachings of Ta7talíya Michelle Nahanee[6], which also helped shape our territorial honourings.

We also thank Daniel Williams for his assistance running the workshops and for reviewing this report. Steve Schut also provided a useful review of this report. The content of this report is shaped by the feedback given by the participants.

We sincerely thank the workshop participants for their time and valuable participation in this process.

[5] https://apihtawikosisan.com/2016/09/beyond-territorial-acknowledgments/
[6] https://decolonizeeverything.org/our-collaborative

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Appendix A - Workshop Participants

Participant Name	Affiliation	Sessions
Matthew Siegle[7] (Facilitator)	ESSA Technologies Ltd.	1.1, 1.2, 2, 3
Aline Litt (Facilitation Support)	ESSA Technologies Ltd.	1.1, 1.2, 2, 3
Dana Haggarty (DFO Lead)	DFO, Groundfish Science, Stock Assessment and Research	1.1, 1.2, 2, 3
Daniel Williams (DFO Support)	DFO, Groundfish Section, Stock Assessment and Research	1.1, 1.2, 2, 3
Quang Huynh (Technical Lead)	Blue Matter Science Ltd.	1.1, 1.2, 2, 3
Adrian Belveal	Commercial Fisherman	1.1, 1.2, 2
Alejandro Frid	Central Coast Indigenous Resource Alliance	1.1, 1.2, 3
Ashleen Benson	Landmark Fisheries	1.1, 3
Bernette Laliberte	Cowichan Tribes	1.1
Chris Sporer	Pacific Halibut Management Association	1.1, 1.2, 2, 3
Christa Rusel	A-Tlegay Fisheries Society	1.1, 1.2, 2
Chuck Ashcroft	Sport Fishing Advisory Board	1.1, 1.2, 2
Dave Renwall	Commercial Industry Caucus - Inside Rockfish/ BC Dogfish Hook & Line Industry Association	1.1, 1.2, 2
David Boyes	Commerical Industry Caucus - Halibut	1.1, 1.2
Devan Archibald	Oceana Canada	1.1, 1.2
Gina Thomas	Tlowitisis First Nation Guardian Program	1.1, 2
Jess Edwards	Ha'oom Fisheries Society	1.1, 1.2, 2, 3
Jim Lane	Nuu-chah-nulth Tribal Council	1.2
Lais Chaves	Haida Nation	3
Lindsay Gardner	Fisheries and Oceans, SARA Program	1.1, 1.2, 2
Mike Kelly	Sport Fishing Advisory Board	1.1, 1.2, 2, 3
Pat Ahern	Sport Fishing Advisory Board	1.1, 1.2, 2, 3
Rob Kronlund	Interface Fisheries	1.1, 2, 3
Rob Tadey	DFO, Fisheries Management, Groundfish	1.1, 1.2, 2, 3
Robert Bocking	LGL	3
Scott Wallace	David Suzuki Foundation	1.1, 1.2, 2, 3

[7] Current affiliation: Fisheries and Oceans Canada, Quantitative Assessment Methods Section

Appendix B - Workshop Agendas

Quillback Rockfish Workshop #1 Agenda
Session #1: Tuesday, February 23rd: 10:00 a.m. - 12:00 p.m. Pacific time
Agenda for Session 1

Time	Item
10:00 – 10:10	Settle-in and Welcome, Land Acknowledgement, Review Agenda
10:10 – 10:20	Quick Introductions: What brought you to the workshop today?
10:20 – 10:35	Opening Remarks and Background • Presentation on the Process • Background on MP Framework • Workshop series and the broader process
10:35 – 11:05	The Decision-context presentation and discussion / brainstorm • Brief Presentation • Discussion (in small groups): Strategic Objectives
11:05 – 11:15	Break
11:15 – 12:00	Objectives Background Presentation and Brainstorm: • Brief Presentation • Discussion (in small groups): Transforming Strategic Objectives into Operational Objectives
---	Meeting Closing and Thank You (in plenary)

Session #2: Wednesday, February 24th: 9:00 a.m. - 11:00 a.m. Pacific time
Agenda for Session 2

Time	Item
9:00 – 9:10	Settle-in and Welcome, Land Acknowledgement, Review Agenda
9:10 – 9:20	Quick Introductions: What about quillback is most important to you?
9:20 – 10:05	Review Objectives from Session 1 and set-up discussion • Summary Presentation on Day 1 feedback • Presentation on how to account for trade-offs in MP Framework analysis • Discussion (in small groups): Commonalities, points of agreement, points of disagreement
10:05 – 10:15	Break

10:15 – 10:40	Objectives conversation continued (small groups)

10:40 – 11:00	Setting up Workshops #2 and #3:
	• Brief presentations and group brainstorm:
	  ○ What is the new and important information since the 2011 assessment to consider?
	  ○ What are the greatest sources of uncertainty to be aware of?

---	Closing Thank You (in plenary)

Agenda - Quillback Rockfish Workshop #2: Inside Stock
Tuesday, March 16th, 10 a.m. – 3 p.m. Pacific time
Agenda

Time	Item
10:00 – 10:05	Settle-in and Welcome, Land Acknowledgement
10:05 – 10:15	Icebreaker round-robin
10:15 – 10:25	Workshop #1 topics and questions that are out of scope for WS #2 and #3
10:30 – 12:00	Topics/Questions Discussion, and Identifying Operational Objectives and Performance Measures (in breakout groups)
12:00 – 1:00	Lunch break
1:00 – 2:55	Refining the Objectives and Performance Measures (in plenary)
2:55 – 3:00	Workshop Closing

Agenda - Quillback Rockfish Workshop #3: Outside Stock
Tuesday, March 30th, 10 a.m. – 3 p.m Pacific time (with 1-hour lunch break)
Agenda

Time	Item
10:00 – 10:05	Settle-in and Welcome, Honoring Shared Territory
10:05 – 10:15	Icebreaker round-robin
10:15 – 10:25	Workshop #1 topics and questions that are out of scope for WS #2 and #3
10:25 – 10:40	Management Strategy Evaluation video and Q/A
10:40 – 11:00	Review Timelines
11:00 – 12:15	Identifying Operational Objectives and Discussion (breakout groups)
12:15 – 1:15	Lunch break
1:15 – 2:55	Refining the Objectives Discussion (in plenary)
2:55 – 3:00	Workshop Closing

Appendix C – Pre-Workshop Questions

Workshop #2: Inside Quillback Rockfish
Please provide answers to the questions below. Your feedback will be compiled by ESSA and used to seed discussions for the Workshop. Please email your answers to Aline Litt (alitt@essa.com) by *Monday March 15th at 12pm PST*.

These questions are focused on the Inside Quillback Stock only.

Feel free to respond to however many questions you feel is appropriate, but do not feel the need to answer questions that you have limited experience with.
There are 7 questions/topics addressed below. Thank you!

1. How do we focus "adequate and predictable" access into operational objectives? • In what situations do we need to consider flexibility over predictability in catch (or TAC)? • In what scenarios do we need to increase or decrease the Total Allowable Catch (TAC)? • How do we implement "real-time" activities with regards to addressing stock increases or declines? • How often should we update the TAC (and what is feasible given monitoring time-frames and data processing)? Note: The Inside area takes two years to survey with the Hard Bottom Longline Survey. There are two levels of data lags: data processing and age-data
answer

2. What are the Quillback (QB) quota needs to support other fisheries? • What level of QB TAC is needed for commercial, recreational, and Food, Social, and Ceremonial fisheries? • What QB TAC considerations are needed for different fleets (e.g., halibut fleet needs "X" QB TAC; lingcod needs "Y" QB TAC), and likewise are there other fisheries that limit the QB fishery (Lingcod, Yelloweye, other)? • For Food, Social, Ceremonial fishers, are QB targeted? Or, are they taken opportunistically but not targeted? • Are recreational fishers targeting QB? Are they not targeted but taken opportunistically? How often are descending devices used on QB?
answer

3. What are objectives you would like to see regarding size and age structure for the inside stock? • Have age and size of catch across sectors changed over time from what you used to catch?

- Are perceived changes in size or age due to abundance vs. other factors (e.g., market demand)?
- Are certain sizes preferably selected or what sizes are generally caught in the fishery you have experience with?

answer

4. Do you have any solutions for obtaining biological samples for size and age from fisheries?

Note: If there is a preference for an age-based model over surplus production models, we need more age data. There are age data limitations.

answer

5. Is a separate north and south analysis necessary for the Inside stock?

- What could be happening in different geographic areas that would warrant spatially distinct analyses?
- What are the objectives among Indigenous fishers regarding spatial scale?

Note: The spatial scale of analysis does not necessarily need to match the spatial scale of management.

answer

6. Managing for Upper Stock Reference (USR) Point and Limit Reference Points (LRP).

Note: Both reference points are required by the Precautionary Approach Policy

- For the USR:
    - How much certainty should there be for achieving the USR (level of probability?
    - What timeframe should be set for achieving the USR (i.e., number of generations)?

answer

7. What top three questions would you be interested in discussing in a breakout group? Please indicate with an “x” in the relevant cells.

Q1	Q2	Q3	Q4	Q5	Q6

Workshop #3: Outside Quillback Rockfish

Hello everyone!

Below are a set of questions we will be discussing at Workshop #3. Those of you who attended the Inside QB Stock workshop will see some similar questions here.

We are providing these questions so everyone can see some of the discussion topics beforehand. We are NOT collecting any answers to these questions prior to the workshop – although any answers sent back to us would be appreciated. Answers we receive will be compiled by ESSA and used to help seed the workshop discussions. If you do want to submit any feedback, please email your answers to Aline Litt (alitt@essa.com) by Monday the 29th.

These questions are focused on the **Outside** Quillback Stock only.

*** If you participated in the Inside Stock workshop (on the 16th), and provided responses applicable to the outside stock then, we will copy over those answers – please don't feel the need to repeat yourself.*

1. How do we focus "adequate and predictable" access into operational objectives?
   - In what situations do we need to consider flexibility over predictability in catch? **Note:** The Outside area takes two years to survey with the Hard Bottom Longline Survey (the north and south regions are sampled in alternating years). There are two levels of data lags: data processing and age-data.

2. What are the Quillback (QB) catch needs to support directed fisheries, and what catch needs for other species (Yelloweye, lingcod, halibut, etc.) are needed to support QB fisheries?
   - For Food, Social, Ceremonial fishers, are QB targeted? Or, are they taken opportunistically but not targeted? Are there any thoughts on QB catch increasing related to food switching given declines in salmon?

3. Is a separate north and south analysis necessary for the Outside QB stock?
   - Does abundance or removals in the north affect future productivity in another geographic (and vice versa)?
   - Are there finer spatial scale objectives not captured in a North/South analysis?

   Do we have the data/ability to address these?

   Note: All QB has be rolled up into one stock to be reported on for the Fish Stock Provisions.

4. Managing for Upper Stock Reference (USR) Point and Limit Reference Points (LRP) and working in non MSY-based paradigms.
    - How can we create objectives to work within both the MSY paradigm and a depletion-based paradigm?
      Note: Both reference points are required by the Precautionary Approach Policy

Appendix D- Slide Decks

Quillback Rockfish Fishery and Conservation Objectives and Performance Measures

Workshop #1: February 23 and 24

Dana Haggarty, *DFO Inshore Rockfish Science*

Quang Huynh, *Blue Matter Science*

Matt Siegle and Aline Litt, *ESSA Technologies*

1

Meeting Considerations

1. Be respectful of everyone's contributions.
2. Take the time you need to speak but be aware of other participants that want to contribute.
1. Keep yourself on "mute" when not speaking.
1. Please stay focused in the moment and do not check email or do other computer work.
1. In breakout room small-group conversations, please share video if your internet connection allows.

2

Find out where you are: native-land.ca

- Why is this acknowledgement happening?
- How does this acknowledgement relate to the event or work you are doing?
- What is the history of this territory? What are the impacts of colonialism here?
- What is your relationship to this territory? How did you come to be here?
- What intentions do you have to disrupt and dismantle colonialism beyond this territory acknowledgement?

3

Overview of Workshop Series

Workshop #1

- Presentations on background and the decision-making process
- General discussion on participant goals/strategic objectives
- Discussion turning general feedback into operational objectives

Workshop #2 (inside stock) and Workshop #3 (outside stock)

- Discussion and Prioritization of Operational Objectives
- Discussion and Prioritization of Performance Measures

4

Workshop #1 (Session 1) Agenda

Time	Item
10:00 - 10:10	Settle-in, Welcome, Agenda
10:10 - 10:20	What brought you to these workshops?
10:20 - 10:35	Background context presentations
10:35 - 11:05	The decision-context: goals/strategic objectives discussion
11:05 - 11:15	Break
11:15 - 12:00	Operational objectives brainstorm and discussion
---	Closing

5

What brought you to these workshops?

- Three rounds of brief 1 on 1 conversations
- Each round is 3 minutes long
- Please introduce yourselves and then answer the question:
  What brought you to these workshops?
- At the end of the 3 rounds, I will ask for you to type a brief answer into the chat

6

Workshop Goals

- Connect and build relationships
- Discuss the decision context Quillback Rockfish
- Gain an understanding of how the MP Framework will evolve
- Develop Objectives for Inside and Outside Quillback Rockfish

Guiding Questions

- *Where are we?*
- *Where do we want to go?*
- *How do we get there?*
- *How long will it take?*
- *How will we know we've arrived?*

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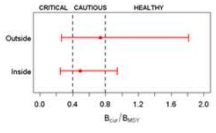
Where are we?



- COSEWIC Assessed as Threatened in 2009
- Outside: 2011 biomass 37.7 (CV 0.65) of 1918
- Inside: 2011 biomass 27.4 (CV 0.47) of 1918
- Recovery Potential Analysis projections over 90 years (3 generations)

https://www.dfo-mpo.gc.ca/csas-scs/Publications/SAR-AS/2011/2011_072-eng.html

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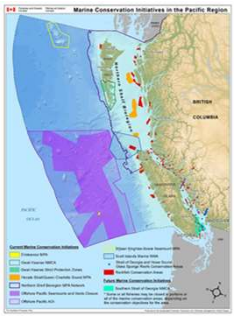
Where are we?



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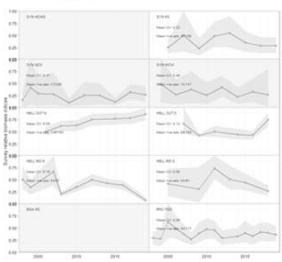
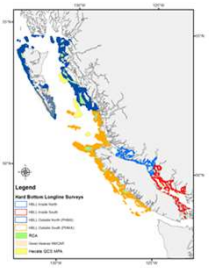
Where are we?

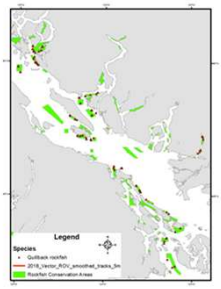




11

Where are we?

- RCA Monitoring Plan in Development.
- CSAS late 2021-22
- Components
  - ROV Surveys: 2009-2012, 2018
  - SCUBA: CCIRA 2006
  - Developing other methods:
    - Passive Acoustics, Stereo Cameras



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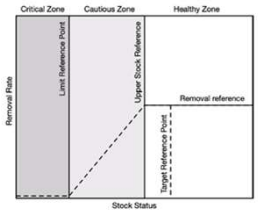
Where do we want to go?



- **Objectives**
  - **Strategic**
    - **Operational**
- Example:
  - Compliance with Sustainable Fisheries Framework Precautionary Approach and Fish Stock Provisions
    - Maintain stock above the LRP
    - Progress towards the Healthy Zone
- **Where else do we want to go?**

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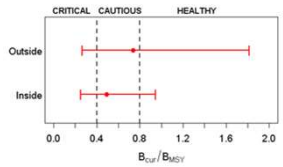
How do we get there?

MP Framework (Anderson et al. 2021)

Aims to find Management Procedures (MPs) that have a **high probability** of achieving stated fishing and conservation **objectives** *even if explicit stock status cannot be reliably estimated.*



https://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2021/2021_002-eng.html

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How long will it take?

- What timeframe is relevant here?
- What assessment frequency is appropriate?
- Quillback Rockfish are long lived
  - Aged to 95 Years
- Generation Time, used in recovery planning calculated in 2011:
  - Outside: 32.0 years
  - Inside: 28.5 years

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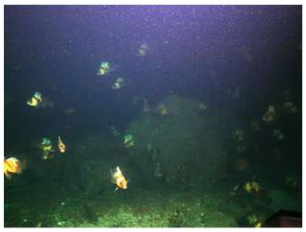
How will we know we've arrived?

- **Iterative Process**
- Performance Metrics calculated in closed loop simulation
- Over the long term, objectives can be updated
- Continued monitoring, learning and discussion



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Brief introduction to MP Framework

(Dr. Quang Huynh, *Blue Matter Science*)

- An approach to identify management approaches that have a high probability of maintaining fish stocks above implicitly known reference points
- A way to bring un-assessed stocks into compliance with Fish Stocks Provisions, but approach not exclusive to data-limited stocks
- One of many tools in the toolbox

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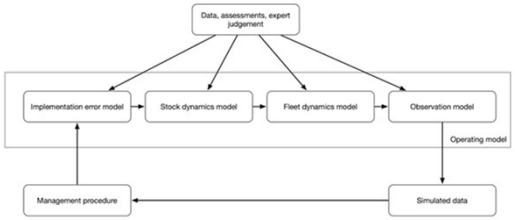
Closed-loop simulation



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Steps of MP Framework

- MPs are ranked and filtered by performance metrics informed by objectives
- Typically, performance measures are identified by a technical working group

Example:

Strategic Objective: Maintain status quo fishery catches in the short-term
Operational Objective: Set future TACs similar to recent catches

Performance metric: Calculate probability that future catch in the next decade is at least 80% of average catch in past decade

Filtering/Satisficing: Consider MPs where probability > 50%

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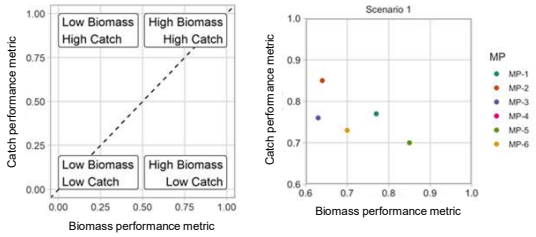
Performance metrics of MPs



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MP Framework Steps

(1) Defining the decision context,
(2) Setting objectives and performance metrics,
(3) Specifying OMs,
(4) Selecting candidate MPs,
(5) Conducting closed-loop simulations,
(6) Presenting results to evaluate trade-offs, and
(7) Formal management procedure review

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Where do we want to go?

- **Objectives should be developed with the participation of managers, First Nations, stakeholders and other interested parties.**
- **Biological, economic, social and political**
- **Different groups will place value of different objectives**
- **Trade-offs are inevitable**

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Examples of Strategic Objectives

Strategic Objectives

- High Level Goals:
  - Achieve Sustainable Fisheries
  - Maintain economic prosperity
  - Maintain Cultural Access

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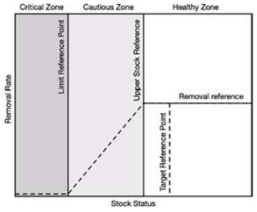
Where do we want to go?



- **Objectives**
  - **Strategic**
    - **Operational**
- Example:
  - Compliance with Sustainable Fisheries Framework Precautionary Approach and Fish Stock Provisions
    - Maintain stock above the LRP
    - Progress towards the Healthy Zone
- **Where else do we want to go?**

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Decision Context: Breakout Discussion (#1)

- Please introduce yourselves to each other in the breakout room.
- Round 1 (3 min), Silent Generation: Reflect on the guiding questions and make some notes for yourself
- Round 2 (23 min), Group Discussion: Open Discussion on everyone's thoughts.

**Ensure feedback is captured on google slide

Guiding Questions

What general goals and Strategic Objectives do *you* want to see put in place?

How does this relate to what DFO has presented?

Do you have any questions about how your goals or objectives fit into the MP Framework?

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Break (10 min)

Photo: Brenna Green

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Strategic Objectives vs. Operational Objectives

Strategic Objectives

- High Level Goals:
  - Achieve Sustainable Fisheries
  - Maintain economic prosperity
  - Maintain Cultural Access

Operational Objectives

- Quantified objectives include a **metric**, the desired **probability of success**, and a **time frame** to achieve the objective
- Probability of maintaining the stock above the LRP is greater than 0.95 [19 times out of 20], in each and every year of a 50-year period
- There may be more than one per strategic objective
- Operational objectives linked to feasible and measurable indicators

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Ex. Inside Yelloweye Rockfish Rebuilding

Core conservation objective for this rebuilding plan is:

1. Rebuild the stock above the LRP over 56 years (1.5 generations) with at least 95% [19 times out of 20] probability of success.
2. Rebuild the stock above the USR over 56 years (1.5 generations).
3. Rebuild the stock above the LRP over 38 years (1 generation).

Given the above conservation objectives are achieved

1. Maintain an average target catch in the short and long term.
2. Minimize variability in fisheries catch from year to year.
3. Achieve positive biomass trends within each 10-year period *for as long as the stock remains below the LRP.*

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Ex. Inside Yelloweye Rockfish Rebuilding

Performance Metrics

PA Framework:

1. **LRP 1.5GT**: P(B > 0.4 B_{MSY}) after 1.5 GT (in 2075, year 56 of the projection period)
2. **USR 1.5GT**: P(B > 0.8 B_{MSY}) after 1.5 GT (in 2075, year 56 of the projection period)
3. **LRP 1GT**: P(B > 0.4 B_{MSY}) after 1 GT (in 2057, year 38 of the projection period)

Catch:

1. **ST C10**: P(average catch > 10 t) during 2020–2029, years 1–10 of the projection period
2. **ST C15**: P(average catch > 15 t) during 2020–2029, years 1–10 of the projection period
3. **LT C20**: P(average catch > 20 t) after 1 GT (in 2057, year 38 of the projection period)
4. **ST AADC**: P(AADC (Average Absolute interanual Difference in Catch) 2020-2029 < current AADC(2012-2019)

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Objectives: Breakout Discussion (#2)

- Round 1 (3 min), Silent Generation: Reflect on the guiding questions and make some notes for yourself
- Round 2 (37 min), Group Discussion: Open Discussion on everyone's thoughts.

Guiding Question

How do we turn the general feedback and strategic objectives into operational objectives?

(Note: there can be more than one operational objective per strategic objective)

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Session Closing

Thank you!

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Quillback Rockfish Provisional Objectives and Performance Measures

Workshop #1, Session 2: February 24

Dana Haggarty, *DFO Inshore Rockfish Science*

Quang Huynh, *Blue Matter Science*

Matt Siegle and Aline Litt, *ESSA Technologies*

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Find out where you are: native-land.ca

Where do you live?

Please paste your answer into the chat

Moving Beyond Territorial Acknowledgements

https://apihtawikosisan.com/2016/09/beyond-territorial-acknowledgments/

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Workshop #1 (Session 2) Agenda

Time	Item
9:00 - 9:20	Settle-in, Welcome, Agenda, Recap from Session 1
9:20 - 10:05	Commonalities, Points of Agreement and Disagreement: Draft Strategic Objectives from Session 1
10:05 - 10:15	Break
10:15 - 10:40	Objectives conversation cont'd:
10:40 - 11:00	Post-2011 New information brainstorm
---	Closing

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Points of clarification

Workshop Project Roles:

DFO (Dana, Groundfish Science) is leading this process with involvement from the Groundfish Management Unit

ESSA (Matt and Aline) is contracted to help create and facilitate this workshop series. (*ESSA* is not writing policy)

Blue Matter Science (Quang) is contracted to perform updated analyses and the MP Framework Analysis

Information Sharing

There will be a summary report after all three workshops that will be made available.

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Workshop Goals

- **Connect and build relationships:**
  - We hope to have your continued involvement as this process evolves (TWG, CSAS, other…)
- **Discuss the decision context Quillback Rockfish**
  - Background of where we are now
  - Policy constraints (PA Policy, SARA, FSP)
  - Governance

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Workshop Goals

- **Gain an understanding of how the MP Framework will evolve**
  - Information generated here will feed into the MP Framework analysis (over the next 1.5 years and beyond…)
- **Develop Objectives for Inside and Outside Quillback Rockfish**
- **Develop hypothesis to test with OM scenarios and Robustness, MPs to test**
  - E.g. catch scenarios, mortality scenarios, RCA/MPA scenarios

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Workshop Goals

- **Knowing where we all want to go with Quillback** (over the long-term)
  - We have bigger questions that require longer time-lines than the upcoming analysis
  - Reconciliation in Fisheries, Indigenous governance and Two-eyed seeing
  - Ecosystem Models and Mixed-stock fishery questions

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Questions from Session 1

- Will we be using the same surplus model presented in 2010? Short answer: NO
- Can Operating Models be age-based? Short answer: YES. We are exploring the model structure supported by the available data for each stock. Age-structured, Stock-reduction analysis and delay-difference models are all more likely than a surplus production model.
- Will the models be updated with new data? YES up to 2021

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Session 1 Summary on Objectives

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Strategic Objective / Feedback	Capture in MP Framework
MP Framework Modeling Considerations 1. Sustainable stocks into the future (ecosystem, economic, cultural, food security)* 2. Maintain predictable fishing opportunities across all sectors* 3. Flexible MP approach (e.g., Bocaccio) 4. Accurate estimates of removals (iRec, creel survey weaknesses) 5. FSC access in inlets (abundance, smaller spatial scales)* 6. Incorporate RCA/MPAs into stock dynamics 7. Take action in "real-time" to address stock decline/increase 1. Explore non-MSY based reference points. 2. Stock-specific reference points 3. Manage for target ref points instead of LRPs 4. Spatial flexibility in fishing opportunity	1. Biomass and catch objectives 2. Catch objectives 3. Consider responsive MPs, OM scenarios with spasmodic recruitment; exceptional circumstances rules 4. Uncertainties in OMs 5. Appropriate scale of analysis? 6. Scenario for closed areas 7. Index-based MPs and updating of models 8. - 10 objectives are reflected in the biomass performance measures. Tests for robustness to steepness (BMSY is implicitly calculated within the OM) 11. Scale of Management?

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Process Objectives / Decision-context	Capture in MP Framework
1. Multi-species based objectives; Ecosystem-based management methods (pred-prey, size classes); broader env. data and env. cues*	**1. ?**
2. Indigenous governance / Two-Eyed Seeing (or other) approaches	2. Corroborate OMs
3. Aligning Federal policies, meet FSP, COSEWIC and SAR objectives*	3. ?
4. Desire for better relationships between DFO and First Nations	4. Continue relationship building

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Strategic Objective / Feedback	Capture in MP Framework
Other Research 1. Efficacy of descending devices to reduce mortality 2. RCA Effectiveness 3. Proactive instead of reactive approach (habitat creation, reef building) 4. Explore methods to study alternative spatial distributions of QB	1. Robustness scenario of reduced mortality 2. Monitoring and research to eventually feed into closed area scenarios 3. Outside of MPF: Marine Conservation Targets, RCAs, Sponge Reefs 4. ?
Value of Information 1. Strive for age-structured data-rich assessments* 2. Collect biological samples from fisheries	1. Eventually incorporate into OMs

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A primer on trade-offs

- **Trade-off:** From a list of acceptable performing MPs, some perform better with respect to one performance metric at the cost of another metric
- Typical trade-offs in
  - Biomass vs. catch
  - Long-term vs. short-term catches
  - Variability in catch/TAC vs. level of catch

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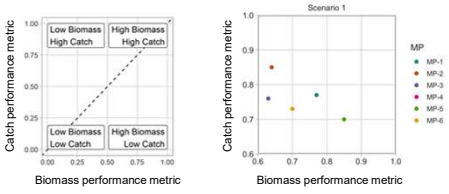
Visualizing trade-offs

- Figures from the MP Framework help us identify trade-offs



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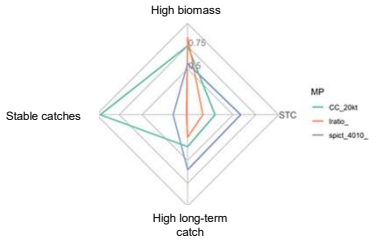
Visualizing trade-offs



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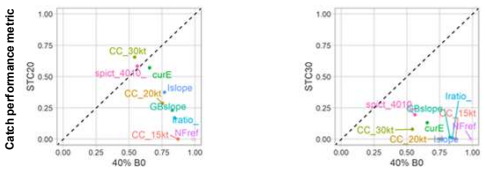
Visualizing trade-offs

- The extent of the trade-off is dependent on how the performance measures are defined



Biomass performance metric

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Commonalities: Breakout Discussion

- Round 1 (3 min), Silent Generation: Reflect on the guiding questions and make some notes for yourself
- Round 2 (32 min), Group Discussion: Open Discussion on everyone's thoughts.

Guiding Question

Given the set of draft strategic objectives, what are commonalities, points of agreement, and points of disagreement?

(Note: Let's focus on identifying the commonalities, etc. We don't need to resolve any issues just yet.)

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Break (10 min)

Photo: Brenna Green

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Strategic Objectives vs. Operational Objectives

Strategic Objectives

- High Level Goals:
  - Achieve Sustainable Fisheries
  - Maintain economic prosperity
  - Maintain Cultural Access

Operational Objectives

- Quantified objectives include a **metric**, the desired **probability of success**, and a **time frame** to achieve the objective
- Probability of maintaining the stock above the LRP is greater than 0.95 [19 times out of 20], in each and every year of a 50-year period
- There may be more than one per strategic objective
- Operational objectives linked to feasible and measurable indicators

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Objectives: Breakout Discussion (#2)

- Round 1 (3 min), Silent Generation: Reflect on the guiding questions and make some notes for yourself
- Round 2 (37 min), Group Discussion: Open Discussion on everyone's thoughts.

Guiding Questions

- What should the time-lines be for short-term objectives and long-term objectives?
- How certain do we need to be to know we have achieved an objective?

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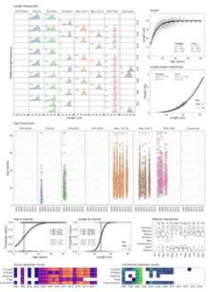
Where are we?



GF Synopsis: https://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2019/2019_041-eng.html

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What is the new (post 2011) information to be aware of?

- Historical Catch?
- Contemporary Catch?
- RCAs?
- Ecosystem?
- Climate?
- Recruitment?
- Other?

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Workshop #2: March 16th (10am - 3pm) *Inside Stock*

Workshop #3: March 30th (10am - 3pm) *Outside Stock*

Dana Haggarty: dana.haggarty@dfo-mpo.gc.ca

Matt Siegle: msiegle@essa.com

Aline Litt: alitt@essa.com

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Inside QB Fishery and Conservation Objectives and Performance Measures

Workshop #2: March 16th

Dana Haggarty, *DFO Inshore Rockfish Science*

Quang Huynh, *Blue Matter Science*

Matt Siegle and Aline Litt, *ESSA Technologies*

Fisheries and Oceans Canada / Pêches et Océans Canada — Blue Matter science LTD — ESSA

Why is this acknowledgement happening?

Find out where you are: native-land.ca

Workshop #2 Agenda

Time	Item
10:00 - 10:05	Settle-in, Welcome, Land Acknowledgement
10:05 - 10:15	Icebreaker round robin: How are you feeling coming into the workshop today?
10:15 - 10:25	Topics and Questions from WS #1: Q and A
10:25 - 12:00	Identifying Operational Objectives (breakout groups)
12:00 - 1:00	Lunch Break
1:00 - 2:55	Refining Operational Objectives Discussion • Questions and Points of Clarification Discussion (breakout groups, 20 min) • Plenary Discussion (90 min)
2:55 - 3:00	Workshop Closing

Icebreaker Round-Robin

How are you feeling coming into the workshop today?

- Say hi to your fellow workshop participants and introduce yourselves.
- We'll plan on 3 rounds at 3 minutes per round

Photo: Tom Collins

Topics / other avenues for discussion

The effects of the Rockfish Conservation Areas (RCAs) and Marine Protected Areas (MPAs) on Quillback Rockfish stock dynamics

- There is a parallel CSAS process happening. The goal of this process is to develop an RCA monitoring plan, and working towards integrating that information into future stock assessments and Management Procedure Framework analyses.

Two-Eyed Seeing approaches and Indigenous Governance and Leadership

- Moving forward we hope to hold a follow-up workshop with First Nations that were not able to attend these workshops. This will be a good place to get a better sense of who should be involved, seek suggestions about developing and sitting on Working Groups, and who can review materials, etc.

Identifying Limit Reference and Upper Stock Reference Points, exploring non-MSY based reference points

- The details of these are better discussed in a Technical Working Group. These discussions will require looking over specific analyses and data.

Strategic Objectives vs. Operational Objectives

Strategic Objectives

- High Level Goals:
  - Achieve Sustainable Fisheries
  - Maintain economic prosperity
  - Maintain Cultural Access

Operational Objectives

- Quantified objectives include a **metric**, the desired **probability of success**, and a **time frame** to achieve the objective
- Probability of maintaining the stock above the LRP is greater than 0.95 [19 times out of 20], in each and every year of a 50-year period
- There may be more than one per strategic objective
- Operational objectives linked to feasible and measurable indicators

Provisional Operational Objectives – Conservation

Operational Objective	Performance Metric
1. Maintain stock status above the LRP in the long term with high probability.	1. LT P40: Probability SB > 0.4 SBMSY (years 36–50)
2. Maintain stock status above the USR with some probability	2. LT P80: Probability SB > 0.8 SBMSY (years 36–50)
3. Avoid overfishing with some probability	3. PNOF: Probability of not overfishing P(F < FMSY) (years 1–50)

Provisional Operational Objectives – Fishery

Operational Objective	Performance Metric
4. Given the conservation objectives are achieved, maximize short- and long-term fisheries yield.	4a. STY: Probability yield > 0.5 MSY (years 6–20) 4b. LTY: Probability yield > 0.5 MSY (years 6–50)
5. Given the conservation objectives are achieved, minimize variability in fisheries yield from year to year.	5. AAVY: Probability AAVY (average annual variability in yield) < 0.2 (years 1–50)

Ex. Inside Yelloweye Rockfish Rebuilding

Core conservation objective for this rebuilding plan is:

1. Rebuild the stock above the LRP over 56 years (1.5 generations) with at least 95% [19 times out of 20] probability of success.
2. Rebuild the stock above the USR over 56 years (1.5 generations).
3. Rebuild the stock above the LRP over 38 years (1 generation).

Given the above conservation objectives are achieved

1. Maintain an average target catch in the short and long term.
2. Minimize variability in fisheries catch from year to year.
3. Achieve positive biomass trends within each 10-year period *for as long as the stock remains below the LRP.*

Breakout Discussions (85 mins)

- Please introduce yourself to everyone in the group
- The group should plan on taking a 5 or so minute break; we don't need to coordinate times, just take it when the group decides is best

- In our breakout groups, we will discuss the questions and participant feedback, and come up with Operational Objectives

(*not necessary or expected that each group will have time to discuss every question/topic)*

Breakout Discussions (85 mins)

- Please introduce yourself to everyone in the group
- The group should plan on taking a 5 or so minute break; we don't need to coordinate times, just take it when the group decides is best

- In our breakout groups, we will discuss the questions and participant feedback, and come up with Operational Objectives and Performance Measures

Example:

Topic / Questions	Participant Feedback	Operational Objectives
How do we focus "adequate and predictable" access into operational objectives?	*- Participant feedback example A*	

Lunch Break (12 - 1pm)

Photo: Brenna Green

Afternoon Session

(115 min) Plenary discussion to review the questions and content provided during the breakout sessions

- *We'll take a 10 min break during this time*

Closing Announcements

1. Slack Channel
2. Is anyone interested in participating on a Technical Working Group?
3. Suggestions for who to ask to participate in a First Nations follow-up workshop

Dana.Haggarty@dfo-mpo.gc.ca
Cell: 250-327-4860

Outside QB Fishery and Conservation Objectives and Performance Measures

Workshop #3: March 30th

Dana Haggarty, *DFO Inshore Rockfish Science*

Quang Huynh, *Blue Matter Science*

Matt Siegle and Aline Litt, *ESSA Technologies*

Fisheries and Oceans Canada Pêches et Océans Canada | Blue Matter science LTD | ESSA

1

Honoring Shared Territory: example from xʷməθkʷəy̓əm (Musqueam), Skwxwú7mesh (Squamish) and səl̓ilwətaʔɬ təməxʷ (Tsleil-Waututh)

https://www.nahaneecreative.com/

Quillback Rockfish Project Goals

- Connect and build relationships
- Discuss the decision context Quillback Rockfish
- Gain an understanding of how the MP Framework will evolve
- Develop Objectives for Inside and Outside Quillback Rockfish

2

Agenda

Time	Item
10:00 - 10:05	Settle-in, Welcome, Territorial Honoring
10:05 - 10:15	Icebreaker Round Robin: What is your relationship to Outside Quillback?
10:15 - 10:25	Topics and Questions from WS #1: Q and A
10:25 - 10:40	Management Strategy Evaluation Video: Q and A
10:40 - 11:00	Timeline Review
11:00 - 12:15	Identifying Operational Objectives and Discussion (breakout groups)
12:15 - 1:15	Lunch Break
1:15 - 2:55	Refining Operational Objectives Discussion (plenary discussion)
2:55 - 3:00	Workshop Closing

3

Icebreaker Round-Robin

What is your relationship to Outside QB?

- Say hi to your fellow workshop participants and introduce yourselves.
- 2 rounds at 3 minutes per round

Photo: Tom Collins

4

Topics / other avenues for discussion

The effects of the Rockfish Conservation Areas (RCAs) and Marine Protected Areas (MPAs) on Quillback Rockfish stock dynamics

- There is a parallel CSAS process happening. The goal of this process is to develop an RCA monitoring plan, and working towards integrating that information into future stock assessments and Management Procedure Framework analyses.

Two-Eyed Seeing approaches and Indigenous Governance and Leadership

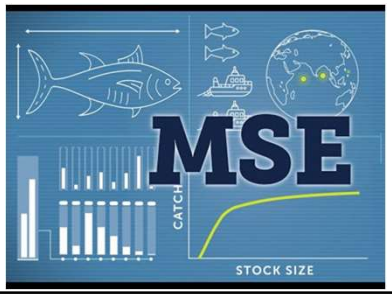
- Moving forward we hope to hold a follow-up workshop with First Nations that were not able to attend these workshops. This will be a good place to get a better sense of who should be involved, seek suggestions about developing and sitting on Working Groups, and who can review materials, etc.

Identifying Limit Reference and Upper Stock Reference Points, exploring non-MSY based reference points

- The details of these are better discussed in a Technical Working Group. These discussions will require looking over specific analyses and data.

5

Management Strategy Evaluation / Q&A



6

Clarifying the term "Catch"

Management measures to control catch:

- Commercial: TACs
- FSC: TAC of "Groundfish" with no mention of QB
- Recreational: Daily Limits of 3 Rockfishes, only 1 of which can be QB. Open April 1 to Nov 15.

In this exercise:

- "Catch" equates to what the model requires: Total "Fishing Mortality" or "F"
- Allocation is a management issue
- **However, we do want our catch objectives to be able to account for and accommodate the needs of all fisheries**

7

Timeline Review

Performance Measures	**(Timeline Component of Objectives); some are policy-based; PA Policy is open when stock is <u>not</u> under a rebuilding plan.**
Hard Bottom Long-line Survey	Every 2 years: North and South surveyed in alternating years
Management Procedures in Analysis	Survey (Index) based MPs: at least 2 years Model-based MPs: at least 2 years (likely more if age-structured model) Fixed Total Catch: never updated
MP Framework Analysis	How often should we revisit Operating Models?
Re-analysis (CSAS review)	5 (or more?) years; (7 years may allow a cohort to move through)
IFMP Planning Process	Annual basis (February)
QB life history	Generation time: 32 years Life span: up to 95 years

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Strategic Objectives vs. Operational Objectives

Strategic Objectives

- High Level Goals:
  - Achieve Sustainable Fisheries
  - Maintain economic prosperity
  - Maintain Cultural Access

Operational Objectives

- Quantified objectives include a **metric**, the desired **probability of success**, and a **time frame** to achieve the objective
  - e.g. Probability of maintaining the stock above the LRP is greater than 0.95 [19 times out of 20], in each and every year of a 50-year period

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Strategic Objectives vs. Operational Objectives

Operational Objectives

- There may be more than one Operational Objective per Strategic Objective
- Operational Objectives must be linked to feasible and measurable indicators (Performance Metrics)

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Provisional Operational Objectives – Conservation

Operational Objective	**Performance Metric**
1. Maintain stock status above the LRP in the long term with high probability.	1. LT P40: Probability SB > 0.4 SBMSY (years 36–50)
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Provisional Operational Objectives – Fishery

Operational Objective	**Performance Metric**
4. Given the conservation objectives are achieved, maximize short- and long-term fisheries yield.	4a. STY: Probability yield > 0.5 MSY (years 6–20) 4b. LTY: Probability yield > 0.5 MSY (years 6–50)
5. Given the conservation objectives are achieved, minimize variability in fisheries yield from year to year.	5. AAVY: Probability AAVY (average annual variability in yield) < 0.2 (years 1–50)

More information on Provisional Operational Objectives available in: DFO (Fisheries and Oceans Canada). 2021a. A management procedure framework for groundfish in British Columbia. Canadian Science Advisory Secretariat Science Advisory Report 2021/nnn. https://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2021/2021_002-eng.html

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Ex. Outside Yelloweye Rockfish Rebuilding

Fishery Rebuilding Objectives:

1. Grow the spawning stock biomass (SSB) above the LRP of $0.4B_{MSY}$) with a very low (5%) probability of further decline, measured over 1.5 to 2.0 generations (57-76 years).
2. When the SSB is between $0.4B_{MSY}$ and $0.8\ B_{MSY}$, limit the probability of decline over the next 10 years from very low (5%) at the LRP to moderate (50%) at B_{MSY}.
3. A preliminary objective for catch is to maximize the probability that annual catch levels remain above a minimum level of **100 t** required to operate groundfish fisheries.

Further collaborative work is required with First Nations and fishery stakeholders to fully specify conservation and fishery objectives for OYE.

More information on Outside Yelloweye Rockfish Rebuilding: DFO (Fisheries and Oceans Canada). 2020a. Evaluation of potential rebuilding strategies for Outside Yelloweye Rockfish in British Columbia. Canadian Science Advisory Secretariat Science Advisory Report 2020/024. https://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2020/2020_024-eng.html

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Breakout Discussions

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- The group should plan on taking a 5 or so minute break; we don't need to coordinate times, just take it when the group decides is best
- In our breakout groups, we will discuss the questions and participant feedback, and come up with Operational Objectives

Topic / Questions	Operational Objectives
How do we focus "adequate and predictable" access into operational objectives?	

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Lunch Break (12:15 - 1:15)

Photo: Brenna Green

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Outside QB Fishery and Conservation Objectives and Performance Measures

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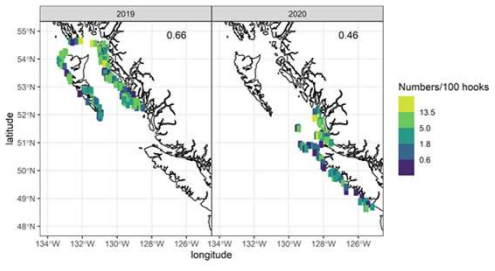
Survey Index Trends



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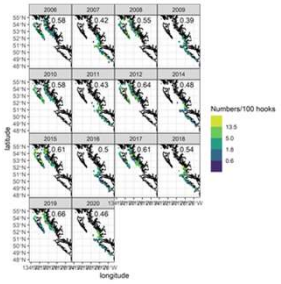
Survey Index Trends



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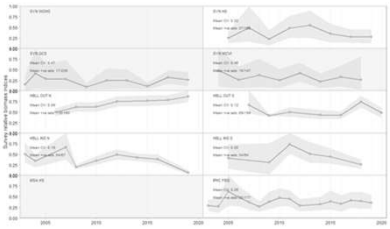
Survey Index Trends



More information on survey trends of Pacific Groundfish available at:
Anderson, S.C., Keppel, E.A., Edwards, A.M. 2019. A reproducible data synopsis for over 100 species of British Columbia groundfish. DFO Can. Sci. Advis. Sec. Res. Doc. 2019/041. vii + 321 p. https://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2019/2019_041-eng.html

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Plenary Discussion

Is a separate north and south analysis necessary for the Outside QB stock?

- Review the questions and content provided during the breakout sessions

1. Do any comments or objectives need further clarification?
2. What additional input do you want the group to consider?
3. Do you have any additional Objectives for the group to discuss?

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Closing Announcements

1. Slack Channel
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