

SUMMARY OF RISK MANAGEMENT KICK-OFF DISCUSSIONS AND SUGGESTIONS FOR POTENTIAL TOPICS

A. Introduction

For the past 10 or so years, the Council has been transitioning away from the era of rebuilding and hoping for one of greater stability, better economic success, and fair and equitable sharing of the benefits earned by restoring stocks to higher abundance. The transition has illuminated challenges and realities of fisheries management even in "good" times.

The Council has also had 15 or more years with the trawl catch share programs, and about the same amount of time working with the annual catch limit (ACL) requirements of the MSA and the related recommendations added to the NS1 Guidelines.

WDFW and others have been noting lessons learned from this experience, including instances where questions about prior assumptions have arisen, for much of this time. With routine workload demands and schedules, along with challenges during and after COVID, and decreased funding for fisheries management issues, it has been difficult to take a step back and reflect on these experiences. For the past year or more, WDFW and members of the WA delegation have been looking ahead to this risk management agenda item as an important opportunity for such reflection. The importance has led some to even pose whether the Council should pause routine management activities if necessary to find the time to focus on solutions for some of the concerns identified.

With such importance in mind and the potentially large number of topics involved, WDFW hosted a meeting on August 20, 2026 to brainstorm and identify topics that were of most interest to members of the WA delegation and discussion on which might have the most promise.

This report summarizes the set of topics the group coalesced around in order to support this early scoping phase. We were also grateful to have participation from Council staff and NMFS at the meeting and were able to hear some of their initial thinking on similar topics and the plan for the risk management discussions. This report is intended to express

thoughts from the WA Delegation and is independent of what Council staff and NMFS may produce for the November meeting.

Also, schedules did not allow for time for all participants to collaborate on this document. The wording is principally WDFW's. The group may follow up with follow-on thoughts and recommendations in a supplemental report. Council staff mentioned that they were preparing a white paper but were only in the planning phase with it at that time, and the group may also wish to revise thoughts or draw connections or differences from what is published there.

As a guide to the rest of this document:

- Section B lists the proposed topics and places them into three broad categories.
- Section C recaps brief ideas on the problem statement.
- Section D provides some additional framing thoughts from WDFW on risk and conservation.
- Section E then provides brief descriptions of the topics and reasons why they may be beneficial to take up.
- The participant list for the August 20 meeting is then given in Appendix 1.
- Lastly, Appendix 2 summarizes simulation work WDFW conducted over the summer.

B. Listing and categorization of the topics

Box 1 lists the topics that rose to the top at the August 20 meeting and places them into three categories: (1) ideas related to assessments, (2) evaluation of harvest policies, or (3) ideas for improving ACL attainment. They are all intended as ideas for achieving conservation outcomes with better economic results for fishing communities.

The topics are described further in Section E. Again, the intent is to introduce them as potential topics to take up as part of the risk management agenda item. The ideas are preliminary and would need considerable discussion and refinement.

Most if not all of the topics would involve review by the SSC. We highlight this for two reasons. First, in terms of project planning considerations it is necessary to work backwards from that review step to think through the types of analyses that would need to be produced, how long those might take to develop, who might be available to produce them, etc.

The other reason we highlight the SSC's role is because many of the topics are connected, or at least aimed at similar ends, and once developed would work together as an overall

framework. The framework would be consistent with the requirements to prevent overfishing and for ACLs to be set consistently with the SSC harvest level recommendations. The SSC's review of the framework's development and application is central to the overall proposal.

Lastly, Council staff advised that they would be emphasizing topics that could be used starting with the 2029-2030 cycle. The likely timeline for implementation is something we also touch on in Section E. It seems clear that some of the topics proposed here would likely take longer. For example, the 2027 stock assessment cycle is starting after the new year. It may therefore not be possible for the topics suggesting new modeling techniques to be tested and reviewed on that timeline. Nonetheless, even if so, work may need to begin now on ideas like that so that they could be ready for the 2029 assessment cycle and so encourage consideration of ideas even if not likely to be implemented until after the 2029-2030 cycle.

Box 1: Potential risk topics and broad categories

Stock assessment methods and planning: *these topics consider methods for possibly reducing volatility in estimating harvest specifications, including ways to deploy limited stock assessment resources.*

- Evaluate modeling techniques for reducing volatility of OFL estimates (e.g. model averaging, ensemble models).
- Further develop risk-based stock assessment approaches, including lighter indicator-based methods for monitoring stock status and when update or new assessments will be needed, to focus on more frequent assessment of key stocks and the possible more intensive decision approaches for special situations.

Harvest policy: *these topics explore ways to respond to stock assessment swings and evaluate ways to prevent overfishing while also respecting the goals of National Standard 8.*

- Review and reflect on risk and policy.
- Develop risk-yield procedures guided by probabilistic and “next step” decision tables for abrupt swings in stock assessment results aimed at least disruption transition to target levels.
- Consider defining overfishing with clearer connection to risk of stock abundance dropping below levels where capacity to produce MSY is jeopardized.
- Procedures to address possible “false alarm” situations (e.g. ways to take preliminary looks at stock status).
- Reconsider biomass reference points using pretty good yield concepts and more deliberate transitions to equilibrium/target levels when above or below target.
- Evaluate automatic harvest control rules that might reduce volatility in OFL swings compared to the existing default HCRs
- Better factor likely attainment levels into risk-decision and stock assessment forecasts.
- Begin to better acknowledge the challenges described as “multispecies pretty good yield” in the literature.

Improving ACL attainment: *these topics involve ways to facilitate more flexible sharing of ACLs*

- Consider multi-year average approaches for determining overfishing.
- Consideration of “hard” allocations versus season planning using “projections with governors” accountability measures and risk to ACL.
- Alternatives to full individual accountability for lightning strike prone stocks in the IFQ fishery.
- Consider inseason transfer framework for key stocks if connected to a multi-year framework that allows for business planning.

C. Problem statement

We call attention to two major aspects of the problem statement.

The first is that groundfish stock assessments have varied widely despite the Council successfully maintaining catch to ACLs. The textbook version of fisheries management—where managers follow the science on where to set quotas, and if successful at keeping catch below them, then good outcomes are achieved—is not one that describes the Council’s experience with groundfish. The impression many around the Council have held is that there have been a number of economically consequential decreases in stock assessment results even for stocks where catch was kept well below scientifically recommended levels.

The second involves catch variability and the challenge of planning seasons among the several sectors of the FMP. There are multiple stocks like canary rockfish where sharing the ACL is very difficult even though the chances of reaching the full ACL remain very low. And the worry is that the Council’s system of allocations is imposing costs and restrictions that go beyond what is needed to achieve conservation goals. The reasons for this unusual dynamic are known but there has been insufficient time to consider ways that could bring relief to the situation.

A major worry noted by multiple participants in the August 20 meeting was that these dynamics create instability for businesses, and in turn make commercial groundfish less attractive to investment. Attracting investment, especially to marketing and processing activities in the bottom trawl sector, is thought necessary for achieving more of the economic success hoped for when the Council created the IFQ program. The Council can only do so much to influence the many factors seafood businesses must deal with in domestic and international markets and the overall business and regulatory climate in which they operate. However, the MSA does require the Council to consider how to achieve conservation outcomes in ways that reduce volatility of quotas and costs of complying with accountability measures. And the hope is that improvements to stability are possible and will increase the economic success of the fisheries.

D. Additional framing thoughts

At the Aug 20 meeting, WDFW emphasized the view that stock assessment uncertainty is likely to remain challenging for the foreseeable future. Improvements to the stock assessment process may be possible. And WDFW remains hopeful that new investments in data collection will be made and that new technologies and cooperative science with industry will greatly increase the data available for assessment. However, even so the

science tells us to expect scientific uncertainty to remain. It appears to be a reality that needs to be embraced.

WDFW's mission involves conserving fish resources while "seek[ing] to maintain the economic well-being and stability of the fishing industry in the state."¹ National Standard 8 challenges the Council with the same mandate, as elaborated on next. The overall challenge involves how to achieve this mandate in the face of scientific uncertainty and catch variability.

1. National Standard 8

There has been significant attention paid to National Standard 1 ever since Congress amended the Magnuson-Stevens Act in 2006 to add the annual catch limit requirement. Much less attention has been paid to the other national standards and their guidelines. Paying them more attention could help bring more shape to conservation and management discussions. They provide recipes for thinking through choices among alternatives, and ways to think about which goals and outcomes the Council should be pursuing.

We mention a few of the National Standards throughout the rest of the report. Here we make the case that National Standard 8 should be brought to the center of this risk management discussion. National Standard 1 and its mandate to prevent overfishing and achieve optimum yield comes first. However, National Standard 8 helps sort through alternatives for achieving that mandate. As summarized in the NS8 Guidelines:

All other things being equal, where two alternatives achieve similar conservation goals, the alternative that provides the greater potential for sustained participation of such communities and minimizes the adverse economic impacts on such communities would be the preferred alternative.²

In this light, NS8 calls for two sets of evaluations. The first involves asking how well each alternative under consideration would achieve the relevant conservation goals. The second calls for examination of how each alternative might affect the potential for sustained fishing participation and the economic impact.

Analyses supporting Council decisions include economic impact information, yet the decisions among alternatives are rarely framed so plainly. We would also assert that the default harvest control rules and procedures for responding to consequential swings in assessment results have yet to be thoroughly examined in this light.

¹ [RCW 77.04.012](#).

² [50 CFR 600.345\(b\)\(1\)](#).

2. Why risk?

Risk is an important concept across many professions. And people have developed a variety of ways of evaluating it. Most share three core pieces:

- an **event** of interest,
- the chances or **probability** that it happens, and,
- the consequences, impact, etc. that result when it does, i.e. the **outcome**.

To keep the discussion light, we do not cite the literature here. We instead emphasize the value of bringing focus to these elements when evaluating the issues posed here.

We step through each briefly. Thinking of “events”, risk is often associated with bad things happening. Yet the framing can also be helpful for good/desirable things as well. For instance, the event of interest can be a policy goal like preventing overfishing or managing catch to ACLs.

Risk arises because events and their outcomes are uncertain. Probability is the language for talking about uncertainty. Even if done approximately or using more qualitative “probabilistic reasoning”, the key is to more directly weigh the chances that an event might happen. This helps avoid binary type thinking (i.e. an event “might” happen) or using worst-case scenario thinking and to weigh trade-offs more directly.

Finally, classical definitions of risk involve multiplying the probability of the event by the severity or consequences. One benefit of doing so allows comparison of rarer events that cause large consequences and more frequent events with lower impact. However, it is less this aspect that we emphasize here and more the need to think more specifically about outcomes. We provide an example of why in the next section.

3. Thinking about conservation outcomes

Conservation is well-known to mean many things to different people. To employ the NS8 “test”, some means of measuring or describing conservation outcomes is needed. There are a number of elements that could be considered from the MSA’s definitions of “conservation and management”, “optimum”, and “overfishing” as well as in various provisions of the statute. However, the two primary metrics we would expect to be used relate to stock depletion and characteristics of expected yield. These are the two main sets of performance metrics used in management strategy evaluation (MSEs) when testing harvest strategies. We discuss this more below under the discussion of “risk-yield” approaches.

Before moving on however, the FMP’s framework for preventing overfishing provides an example of how the three elements of risk might be helpful for building understanding and evaluating how well rule-based approaches are performing. The FMP’s framework stems from the NS1 Guidelines. Those guidelines define the “event” of interest as catch exceeding the OFL in a year.³ However, the outcome of that event depends on many factors. In some cases, the outcome could be inconsequential. For example, we raise the question below about multi-year approaches to defining overfishing. The question is whether expected stock depletion would remain on track if an overage of the OFL was balanced out by underages in neighboring years. A related question is whether the management effort and costs aimed at minimizing the chances that catch exceeds the OFL are proportionate to conservation benefits.

Likewise, the elements of risk can be used to build understanding of how the “risk of overfishing” that the p-star approach addresses differs from the overfishing determination. For p-star, the event of interest is the ABC being set higher than the “true” OFL. The point we emphasize here is that the Council has yet to have full discussion of how to consider the expected “outcome” of using the standard value of 0.45 or alternatives. That standard value equates to a 55 percent chance that the ABC is lower than that theoretical true OFL.

4. Thinking about what is allowable

The risk management discussions are likely to raise questions about what is currently allowed by law. In the federal world Congress is the ultimate setter of policy and made certain choices, implicitly or explicitly, by enacting and amending the Magnuson-Stevens Act. NMFS reviews Council recommendations for consistency with law, and the courts create case law. All in all, the Council’s policy discretion may currently be limited by those decisions. However, if that is the case for some options it does not mean that they should be left out of the mix for evaluation here. For one, Congress can always change the law. The fisheries policy world is not large. The Councils are important “laboratories” for confronting the statute’s provisions and the National Standard guidelines against real world situations. If analysis shows that an option could lead to better outcomes for conservation and fishing communities, that is important feedback to the policy process.

E. Further description of the topics

In this section, we describe the topics listed in Box 1 in additional but still brief detail and group the discussion of similar topics together. Importantly, our intent is to describe why we see enough potential to propose they be discussed under the risk management agenda

³ [50 CFR 600.310\(e\)\(2\)\(ii\)\(A\)\(2\)](#).

item. Where unclear, the language we use in the descriptions should be interpreted as intended to pose questions and not to provide answers. The opportunity for dialogue with fisheries scientists has been minimal so far. If they are taken up, a lot more discussion and consideration of detail would of course be needed. It should also be noted that time has not allowed for much discussion on the relative priority among the topics, or on how they could be sequenced or worked on in parallel.

1. Review and reflect

This first step would involve building more common understanding of the Council's existing harvest policies to aid deliberations on the other risk management topics. The last couple of assessment cycles have made clear that time for such science-policy dialogue is needed.

Identifying the key questions to take up might be the first step, and could even begin at this meeting. For one, we know there is interest in better understanding which aspects of the existing harvest control rules involve policy or risk choices and which are more purely matters of science. For example, the B40% target and SPR harvest rates for rockfish were set decades ago and it can be difficult for non-experts to piece together the reasoning behind them or to see where the line between science and policy exists.

There have been expressions from the GAP and others that the Council is more risk-averse than needed. The Council has not yet taken the time to review its p-star based approach, at least very thoroughly, despite having many years of experience with it. As noted above, there does not appear to be common understanding of how the policy choices it provides to the Council link to conservation outcomes. In addition, the GAP and others have raised questions about sigma and especially the time-inflating aspect. The risk table proposal was likewise met with skepticism and worry that it would lead to additional and unnecessary "buffering" of allowable catch. WDFW is not aware of what the state of the science says about these concerns.

We imagine there are many questions that would benefit from interaction between the scientists, managers, and stakeholders. The hope is that this review and reflection step would involve multiple opportunities for Q&A between the Science Centers and SSC and the GAP, Council, and GMT through in-person sessions and written responses. As discussed below, assessment volatility is expected to remain even if the initiatives taken up in the risk management discussion and elsewhere are successful at mitigating it some. This step will lay the foundations for ongoing efforts to ensure that all involved with the Council have the time to reflect on scientific uncertainty, that the assessment community is

exploring and communicating about the uncertainty with the Council and public, and that we continue to have science-policy discussion on expectations for fishery stability.

2. Simulation testing of alternative harvest control rules and modeling techniques for reducing assessment-to-assessment volatility

Appendix 2 summarizes some simulation work done by Dr. Claudia Friess over the summer based on widow rockfish on this topic and we direct the reader there for more detail. In brief, we are unsure to what extent the Council's default harvest control policies have been tested against the type of volatility seen in recent assessments. This topic would involve evaluating other approaches against the default approach using Management Strategy Evaluation type simulation and compare how each performs in terms of OFL variability and other metrics. The evaluation could also include alternative modeling approaches, like the "model average" example in Appendix 2 or ensemble models like used by the International Pacific Halibut Commission. Following the conceptualization of stock assessment uncertainty following a lognormal probability distribution, the rough analogy may be to a single model equating to a single random draw from that distribution. In theory, the more draws one takes from a distribution the better the estimate of the distribution's mean becomes. On that, we note the connection to some of the ideas in the next topic on stock assessment planning and priorities. One of the best-known approaches for addressing scientific uncertainty is conducting assessments more frequently.

On timing, with the 2027 assessment cycle beginning after the New Year or even sooner it may not be practical to conduct the necessary analysis and review steps in time to implement in the 2029-2030 cycle. Nonetheless, the analysis it involves could be important for addressing some of the questions that arise in the review and reflect stage. And there could be ways to begin or at least plan for the work even if implementation comes later.

3. Further advancing risk-based stock assessment planning

This topic is being recommended and advanced by the Science Centers and called out here because of its connections to the other proposals. By "risk-based" we mean employing limited stock assessment resources to priority needs. The Council has long had a stock assessment priority process. The Science Centers are bringing new ideas, like the 10-year planning window, using lessons learned on trade-offs in model structure complexity, and exploring indicator approaches for evaluating low attainment stocks and when data might suggest an update or full assessment might produce a different view of stock status. As noted in the previous topic, one goal might be to free up resources for more frequent update assessments of key stocks as this is one known method for reducing volatility in assessment estimates.

This item also connects to other topics as well. For example, if the Council were able to address the pressures that management measures and allocations of stocks like canary rockfish create on fishing sectors then there may be less need to assess those stocks as frequently.

4. Alternative approaches to evaluating when overfishing is occurring

These topics address the question raised above about the narrow manner in which the FMP defines overfishing now and the degree to which the Council expends effort on avoiding events that may not raise serious concerns over conservation outcomes.

Multi-year average evaluation of overfishing

In June 2025, the Council requested by motion that Council staff begin discussions with the SSC on how this topic might be evaluated. The topic relates to the manner in which the overfishing status determination is made, yet the primary benefit expected would be more flexible sharing of the ACL. For one, it would help facilitate a fuller carryover program that could help alleviate the lightning strike risk-aversion dynamic. It would also be a key part of maintaining stable fishing opportunities using the catch projections and “governors” approach.

The topic would involve evaluating something like a three-year moving average of catch and OFLs to evaluate whether overfishing occurred. A three-year evaluation period, for example, could potentially be designed so that catch exceeding the OFL in Year 1 would not equate to overfishing if catch in Years 2 and 3 offset the overage (perhaps also involving adjustments for natural mortality). The same approach would be mirrored in planning seasons and evaluating the probability of catch exceeding ACLs. The goal of planning would be to keep the probability of exceeding the average appropriately low.

Importantly, this topic is distinct from the discussion of risk and scientific uncertainty. It presumes that the ABC is set with the desired risk tolerance. Also importantly, the multi-year approach would be intended to achieve the same general conservation outcomes that attaining ACLs in full every year would achieve. For example, if an assessment forecast predicted a stock to be at B45% in five years with a 75 percent chance of being above B25% under full ACL attainment, the multi-year approach would be expected to leave the stock in the same or at least a very similar place.

The primary step would be SSC review of the approach and its suitability for preventing overfishing. We suspect, however, that there would also be some complexities to work out on how overages are corrected for among sectors. Our assumption is that the topic could be relatively straightforward for the SSC to review. The analysis they would consider may

already be being worked on as part of their review of the Harvest Specifications Flexibility agenda item and consideration of the ABC carryover. More fundamentally, it is an approach that the SSC has noted in many past discussions, namely that SPR harvest control rules are robust to overages if balanced by underages on biologically appropriate timelines. If catch fluctuates around the desired SPR level, the desired level of spawning occurs, and good conservation outcomes are expected. This is how the proposed SPR harvest control rule for North Pacific albacore was described to the Council, the fleet, and internationally.

In the past, the NS1 Guidelines have been seen as a roadblock to using an approach like this. Using the elements of risk described above, the evaluation would compare this multi-year approach to forecasts of full ACL attainment. If conservation outcomes turn out to be similar, we would question why the NS8 Guidelines wouldn't argue for the more flexible approach. The NS1 Guidelines also speak to the use of multi-year approaches in limited cases, and we suspect that the rationale behind those provisions could be shown to apply here.⁴

Connecting overfishing determinations to stock depletion

The MSA's definition of overfishing speaks to the rate or level of fishing mortality that jeopardizes a fishery's capacity to produce MSY on a continuing basis. As noted above, the FMP and NS1 Guidelines define overfishing as catch exceeding the OFL regardless of whether the outcome of the "event" would be expected to cause such jeopardy. The question is whether there are ways to better ground overfishing in the probability of stocks dropping to concerning levels. For one, this might more clearly focus the Council and public on the risks scientific uncertainty poses and separate situations where concern is low from those where it should be high.

This question connects to the topic on reviewing harvest policies using the concept of pretty good yield and deliberate choices about risk-yield trade-offs when fishing stocks up or down toward equilibrium/target levels after surprising assessment changes and may best be evaluated as part of that discussion.

5. Risk-yield approaches and review of depletion reference points using the concept of pretty good yield

Better incorporation of expected attainment into risk decisions

We only briefly describe this topic idea here, but we highlight its importance. Improvements have been made over time, but assuming full attainment of ACLs in stock assessment

⁴ [50 CFR 600.310\(e\)\(2\)\(ii\)\(A\)\(3\)](#).

forecasts still occurs even where the likelihood of it happening in reality is small. Likely attainment should be recognized as part of risk discussions and as involving a policy/risk choice.

The Council's consideration of Dover sole in the last cycle provides an extreme example of how assumptions about full attainment can affect policy choices. In short, the Council ended up changing its ACL recommendation, which was based on a "skip the windfall" type approach, because catch was assumed to be tens of thousands of metric tons higher than actual catch. It was partly a matter of workload capacity, and there was little real world effect, but the point of emphasis is that a more realistic assumption on attainment in the original forecast would have avoided the situation.

The other aspect of this is that likely attainment can factor into overall risk. It is not the ABC that creates "risk" but instead the fish that are actually removed from the population. As a simple example, if it is likely that only 75 percent or less of the ACL will be caught then there is effectively a 25 percent or greater buffer between the ABC and OFL irrespective of a deliberate selection of a p-star value. With input from the GMT and the GAP, it would be possible to directly assess expected attainment and frame it as part of the policy call on where to set p-star or other uncertainty buffers. Alternatively, low attainment stocks may be flagged as not needing thorough discussion of risk when setting ABCs.

Incorporating risk-yield procedures into the FMP

The Council's response to the 2025/2026 widow rockfish assessment is an example of what we call a risk-yield procedure here. The SSC supported the Council's use of the approach and final ABC recommendation, but also expressed concern about using "ad hoc" approaches in the future. This topic would evaluate how to make such approaches a standard option under the FMP so that they are no longer ad hoc.

The procedures would likely be reserved for responding to major swings in assessment results and for highly attained ACLs. In contrast to the alternative harvest control rules topic noted above, where control rules are prespecified, the risk-yield approach uses the specific information and circumstances of the stock assessment's decision table to compare options of responding to an unexpected assessment result. The question would be how to best transition to equilibrium levels in a manner best consistent with NS8. As noted in the WDFW report on widow earlier this year, an economist would analyze it as a rate of investment in a stock of capital type of question and the goal would be to choose the rate that produces the optimal long-term result. This thinking matches what is called for by NS1 and optimum yield. Without scientific uncertainty, the analysis would be relatively straightforward. Scientific uncertainty, however, requires consideration of the risk posed by alternative catch strategies. The common worry about fisheries managers is that

they are prone to giving undue weight to short-term economic needs. The risk-yield approach would be intended to confront that question head on and allows direct examination of how a particular recommendation weights short-term concerns against long-term conservation outcomes.

The approach taken with widow was made possible using the probabilistic decision table produced by the stock assessment team that allowed yield streams to be compared not just with the base model's forecast of depletion trajectories but also with the approximate probabilities of dropping to low depletion levels, including under the low state of nature forecast. We understand that the Science Centers have been developing decision tables that can take the next step of describing what ABCs would look like under the low state of nature under different catch scenarios. This would aid the risk-yield trade-off discussion by bringing more specificity to the "outcome" associated with the low state of nature.

Thinking back to the pre-2025 widow rockfish situation, the stock was thought to be well above target and so ACLs were set based on a fishing down phase. If the Council had a "next step" decision table at the time, it would have likely shown that the low state of nature would involve ABCs in the ballpark of what came out of the 2025/2026 assessment. All hypothetical of course, yet the Council might have chosen a slower trajectory towards target levels if the question were presented in risk-yield fashion instead of through p-star.

We note also that the Council's successful rebuilding plans were essentially risk-yield approaches that operated under the specific MSA provisions referring to the need to rebuild stocks as quickly as possible but with some leeway to account for short-term needs of fishing communities.

Evaluating depletion reference points using the concept of pretty good yield

This topic also relates to the one just discussed on risk-yield transition procedures. There are a number of papers in the literature describing the concept. In short, the theory is that the annual yield that can be taken from stocks remains similar over a wide range of abundance levels.

The Council has not reviewed the concept in detail, although its existing reference points are based on a similar idea, namely that MSY cannot be estimated with the data we have or without knowing the particular form of density dependent response and so proxies are thought to be "close enough" approximations to the rate and abundance levels that produce MSY. Another connection between this and the reflect and review topic is how the current proxies depend on the assumed "steepness" (which defines productivity or density dependence in recruitment) and which level of depletion a SPR proxy harvest rate would be expected to equilibrate.

Again with the main purpose of responding to unexpected assessment results, the question would be whether additional “zones” could be helpful in evaluating ways to transition stocks to target levels, either from above or below target. The question of how much more or less yield to expect at target levels is not discussed as much as it could be.

By zones, we refer to the “precautionary zone” between B25% and B40%. And the question is whether zones could be evaluated, both above and below target, and as expressed possibly as being within X percent of the annual yield expected at target levels. As one example, if the expected yield at B40% for a rockfish stock was 6,000 mt and at current levels produced an OFL of 4,500 mt then it would be the 75 percent zone. For stocks above target, the question would be what the annual yield would be if not fished down (i.e. without the “windfall” portion). In the hypothetical example of a stock in the 80% zone above target, the Council could directly weigh the option of leaving the stock at higher abundance or fishing it down more slowly. The Council does not have a systematic way of considering the fish down phase (although, Dover sole is an example of an alternative approach, and Rougheye/Blackspotted is a very recent example as well).

Preliminary status evaluations and false-alarm procedures

The Council has long had concerns about data poor and data limited methods and the possibility of “false alarms”. At one point, the Council had recommended a flow chart that called for more intensive assessment approaches where data allows before fully reacting. The question to evaluate here is whether there could be preliminary or exploratory assessment methods that might highlight stocks where status should be examined more intensely. This topic relates to the risk-based stock assessment planning topic as well, as risk-based often means using less intensive efforts to identify where limited resources should be employed more intensely to the greatest risks.

One thought has been that the Council’s harvest policies appear to leave stocks resilient enough to take more gradual approaches to meet long-term conservation outcomes. It is much less clear that fishing businesses are as resilient to economic shocks that can result from scientific uncertainty. The intent would be again to confront the trade-off between short-term economic impacts and long-term conservation goals directly and openly. As we discuss below on the topic of multispecies pretty good yield, there is the chance that trade-offs will be made by default if some stocks are not assessed.

6. Ideas for increasing stability under catch variability

Review of allocations and differentiating allocations from season planning using empirical approaches

WDFW provided multiple reports on this general issue over the last year or so, focused on the challenges of sharing the canary rockfish ACL among sectors. We do not repeat the concerns in detail here. The fundamental issue noted in those reports is that allocations or other “soft” planning amounts are deducted from the ACL as if they are 100 percent likely to be caught.

This topic was also referred to as “catch projections with governors” at the Aug 20 discussion and is descriptive of the original intent behind the Council’s approach to sharing ACLs among the groundfish fishery sectors. At some point in time, it was deemed required for the Council to assume 100 percent attainment of certain allocations. This practice violates risk-based principles because empirical approaches (i.e. using data, models, and practical experience) tell us that the probability of the ACL being taken in full is extremely low for many stocks.

The MSA’s grounding in NS2 and best available science, as also called out in NS8, would argue for using empirical approaches when planning seasons. NS4’s requirement that allocations be reasonably calculated to promote conservation, and NS6’s requirement to take into account and allow for variations and contingencies in catch would also argue for an evaluation of how ACLs are shared for key stocks.

The overarching goal of this topic would be to consider how to provide more stability for fishery sectors while also ensuring that the fishing opportunities collectively provided by the Council would keep catch to ACLs. There is an important distinction to consider between: (1) the amount of catch “allocated” to a sector; and, (2) the amount of catch a sector might take in a year given a set of proposed management measures. When multiple sectors are involved, the latter becomes a complex “joint probability” problem but also one that can be worked through using projection models and “probabilistic reasoning”.

This topic also pairs with the multi-year evaluation of overfishing and ACL accountability.

WDFW understands that case law has been raised as a concern. From a policy perspective, we believe those concerns are addressable. For instance, the idea here is that the SSC would review the Council’s overall approach for planning fishing opportunities. If they conducted a review and concluded that catch was likely to keep to ACLs and prevent overfishing, it is difficult to understand what the legal concern would be. If it turns out that the courts have left no room for such approaches, this would be an example of where

analysis could serve as important feedback to Congress. Some interpretations of the case law raise serious questions about the coherency of the statute as a whole and are in direct conflict with common practice in fisheries and natural resource management.

Set-asides and alternatives to individual accountability in the IFQ program for lightning-strike-prone and other incidentally caught stocks

The challenge posed by lightning strikes and set aside management has been discussed around the Council and by the GAP and the WDFW Reports on canary rockfish for example. So we do not go into detail here. The need to consider addressing the dynamic is clear to many.

One aspect of fairness shared by many is that it feels unfair to penalize people for outcomes that aren't within their control. It has become clear that lightning strikes can happen even when best fishing practices are followed. Conservation need or other offsetting benefits can justify such types of unfairness. However, it would appear that there could be several options for reducing the costs to IFQ participants while improving conservation outcomes.

Possible options may best be taken up with the package of potential improvements to the catch share programs. The topic also fits with the risk management agenda item because it is clear that there is a need to think about probability and outcomes faced by individual fishing businesses and across the trawl fisheries as a whole.

7. Lower priority or potential future topics

Inseason transfer framework

The Council employs inseason adjustments to move allocations among sectors in other FMPs. Salmon and halibut are two examples of where the approach has been used successfully to move fish when some sectors are catching less and other sectors more than anticipated. The possibility of this approach working for stocks like canary rockfish has been discussed around the Council at various points in time. At the August 20 meeting, we discussed the challenges involved especially for the trawl fisheries. As the GAP have explained in the past, fishing and business plans require more certainty and inseason transfers would happen too late in the year to be of much benefit. Some of those planning challenges might be overcome if combined with a multi-year approach. However, there may also be less need for inseason transfers under the multi-year approach. There could, however, be some utility in an inseason transfer framework that would facilitate "payback" type approaches intended to create sector accountability.

Multispecies pretty good yield

This topic is likely too complex to be a first step. However, at some point the Council should consider the topic because multispecies yield is a reality of the Groundfish FMP. Without taking the topic up in full now, it may be beneficial to keep multispecies considerations in mind to some degree with the other topics to be taken up in the risk management evaluation.

At present, the FMP's implied view of success would be to have all flatfish at their B25% target levels and all other groundfish at B40%. For many reasons, this will never happen. The Council could take sector by sector evaluations of which stocks drive revenues in commercial sectors and fishing experiences in recreational sectors to gauge more realistic target levels. The exercise could be helpful for business planning in terms of providing fuller scoping of overall economic potential under existing harvest policies and other options.

There are a number of articles in the literature describing how it is not feasible to produce MSY for every stock in a mixed fishery. The MSA defines OY in terms of the fishery, defined as one or more stocks and the fishing for them. There are also a number of articles in the fisheries literature that consider the concept of combined, aka aggregate, yield across mixed fisheries. And maximizing yield likely requires fishing some stocks to lower abundance than their single species MSY level. The NS1 Guidelines place limits on this currently. Going beyond those limits would warrant careful consideration of risk and trade-offs. At the same time, it should also be recognized that fishing down stocks could also happen "by default" if lower productivity and less desirable stocks are not given appropriate attention in data collection and assessment.

Spiny dogfish is one where difficult questions could arise. Recent research suggests a declining trend across the eastern North Pacific, and previous West Coast assessments have shown large uncertainty with some sensitivity runs showing levels that could create very challenging situations where ACLs would be set to levels likely to be exceeded in some years when trawl fisheries experience large bycatch. Such a situation might be addressable by the other topics relating to whether exceeding an ACL occasionally leads to outcomes of concern. It also may lead many to question if dogfish is a stock that people want to manage to MSY.

For another plausible example, the Washington recreational fishery has had to limit retention of stocks like vermilion and quillback rockfishes even though they are estimated to be above their B40% targets. WDFW has resisted recommending no retention of these species because then the data streams needed for stock assessments would be cut off. The stocks could become further limiting if existing measures are ineffective at lowering catch. For the hypothetical situation, say that analysis showed that the stocks could be

fished at slightly higher rates and be maintained between B30% and B40%. Some would see this as better policy because it improves stability in the fishery, maintains the less desired populations at safe abundances, and allows continued data collection for assessment updates. In contrast, the hypothetical situation could be different with analysis showing a high probability of the stocks dropping below B10% if fishing intensity were increased. In this situation, many might have concerns about the approach being too risky.

Appendix 1

Participants in the August 20 Discussion

Phil Anderson, GAP

Aaron Berger, NMFS NWFSC (virtual)

Chris Biggs, WDFW

Merrick Burden, Council staff

Heather Fitch, WDFW

Claudia Friess, WDFW

Heather Hall, WDFW

Owen Hamel, NMFS NWFSC

Gretchen Hanshew, NMFS WCR

Megan Mackey, NMFS WCR (virtual)

Kristen Marshall, NMFS NWFSC (virtual)

Sarah Nayani, GAP

Corey Niles, WDFW

Whitney Roberts, WDFW

Aja Szumylo, WA Council representative

Theresa Tsou, WDFW

Jessi Waller, Council staff

Appendix 2

Evaluating modeling options for reducing OFL volatility: a demonstration using widow rockfish as an example

Summary

We conducted a simulation analysis with the goal of exploring options for improving quota stability when stock assessment results are highly variable. We used widow rockfish as an example. We tested four alternative options for specifying OFL and ABC, including the current default approach. All four options had similar performance with regard to stock health and overall landings over the simulation period, but the default rule performed worst at dampening extreme year-to-year swings in quota. This analysis is an example of how the Council could choose to evaluate alternative options for achieving conservation outcomes while minimizing negative outcomes for fishing communities when stock assessments are highly uncertain.

Introduction

Stock assessment advice can vary widely between successive assessments, causing discontinuities in overfishing limit (OFL) and acceptable biological catch (ABC) catch streams that negatively impact industry and fishing communities. Some stock assessment uncertainty is irreducible, stemming from process error (mainly recruitment deviations, especially those in the most recent years). Other uncertainty is due to model and parameter uncertainty which can, in theory, be reduced by collecting better and more representative data or improving model structure. For the purpose of this demonstration, it is irrelevant what the cause of the assessment uncertainty is; all that matters is that it exists. The goal is not to improve the accuracy of stock assessments but to improve the use of allowable catches produced by highly variable assessments. Using the widow rockfish 2025 stock synthesis model files obtained from GitHub, we turned the latest widow rockfish model into an operating model and tested four alternative control rules against stock conservation, landings, and quota stability metrics to see which control rules provided better quota stability while meeting conservation objectives.

Methods

The latest fitted widow rockfish stock assessment model served as the operating model (OM) which represents reality in the simulation. The operating model was projected forward for 25 years under recruitment variability and fishery removals at the magnitude of the ABC. Every 5 years, data were generated from the OM and used in an estimation model (EM) that matched the structure of the OM. In addition to recruitment variability, uncertainty was introduced by randomly fixing key productivity and natural mortality parameters in the EM at the wrong value. As a result, the EM sometimes overestimated and sometimes underestimated the ‘true’ annual

spawning stock biomass (meaning the biomass simulated by the OM). The EM produced OFL and ABC catch streams according to these four control rules:

- Default: the current real-world method to produce OFL and ABC, where the OFL is $F_{SPR50\%}$ applied to vulnerable biomass which the EM projects, and ABC is the OFL as reduced by the default P^* buffer
- Average F (avg_f): Same as default except the OFL is the running 3-year average of default OFLs
- Cap maximum allowable year-to-year OFL differences (max_diff): Same as default except impose a maximum OFL year-to-year percent difference of 20% and adjust remaining years so the sum of projected OFLs matches the sum of OFLs from the Default rule as closely as possible
- Model average (avg_model): Same as default except the OFL stream is the average of current and previous estimation models

Each of the four control rules was tested using 100 iterations, and at the end, the following performance metrics were calculated:

- Two stock health metrics: mean and minimum biomass ratio over the projection period
- Two overall landings metrics: total landings and standard deviation of landings over the projection period
- Two year-to-year quota stability metrics: the median and 95th quantile of percent differences in retained catch from one year to the next

Results

The biomass ratio trajectories generated by applying the four control rules over time looked similar but the landings trajectories and year-to-year differences in landings showed differences (Figure 1). For all control rules, the discontinuity in landings streams when new assessments are performed (every 5 years) are clearly visible in the Figure 1 ‘landings’ and ‘percent difference in landings’ panels. Figure 2 shows that there is very little difference in biomass metrics between the four control rules, neither in the median (Figure 2 spiderplot) nor the spread (Figure 2 boxplots). Mean biomass ratio was highest for the default control rule (0.45) and lowest for the model averaging control rule (0.43)—a negligible difference. Similarly, the difference in the medians of the minimum biomass ratio between the best (‘max_diff’) and the worst-performing (model averaging) control rule was also only 0.02 (0.38 vs 0.36, respectively). The four control rules also performed equally well with respect to total landings, with model averaging having the highest total landings of 159,551 mt over the simulation period and the default control rule having the lowest with 154,812 mt. The landings time series had the lowest variability (landings SD) for the model averaging control rule at 1,439 mt, and the ‘max_diff’ control rule had the highest at 1,869 mt. The largest difference between control rule performance occurred for the ‘annual stability’ metric (the median percent difference in retained catch from one year to the

next) where the model averaging control rule performed best with a median of 3% and ‘max_diff’ was worst with a median of 9.5 percent. The ‘max_diff’ rule also had notably higher variability in the results for this metric than the other rules (Figure 2 boxplot). This is because even though the swings in OFL from one year to the next were capped at 20% for this rule, the difference between the default OFL and the one produced by this rule were carried forward and spread over the remaining years in the projection period. This made the percent difference between successive years higher over the entire projection period for some iterations and not just during the transition period from one assessment’s OFL stream to the next. Finally, both the ‘max_diff’ and model averaging rule performed about equally well at dampening the most extreme quota reduction events, represented by the ‘extreme annual swings’ metric (the 95th quantile of percent differences in landings from one year to the next) while the default rule performed worst for this metric (42% vs. 21% for model averaging and, by design, 20% for ‘max_diff’).

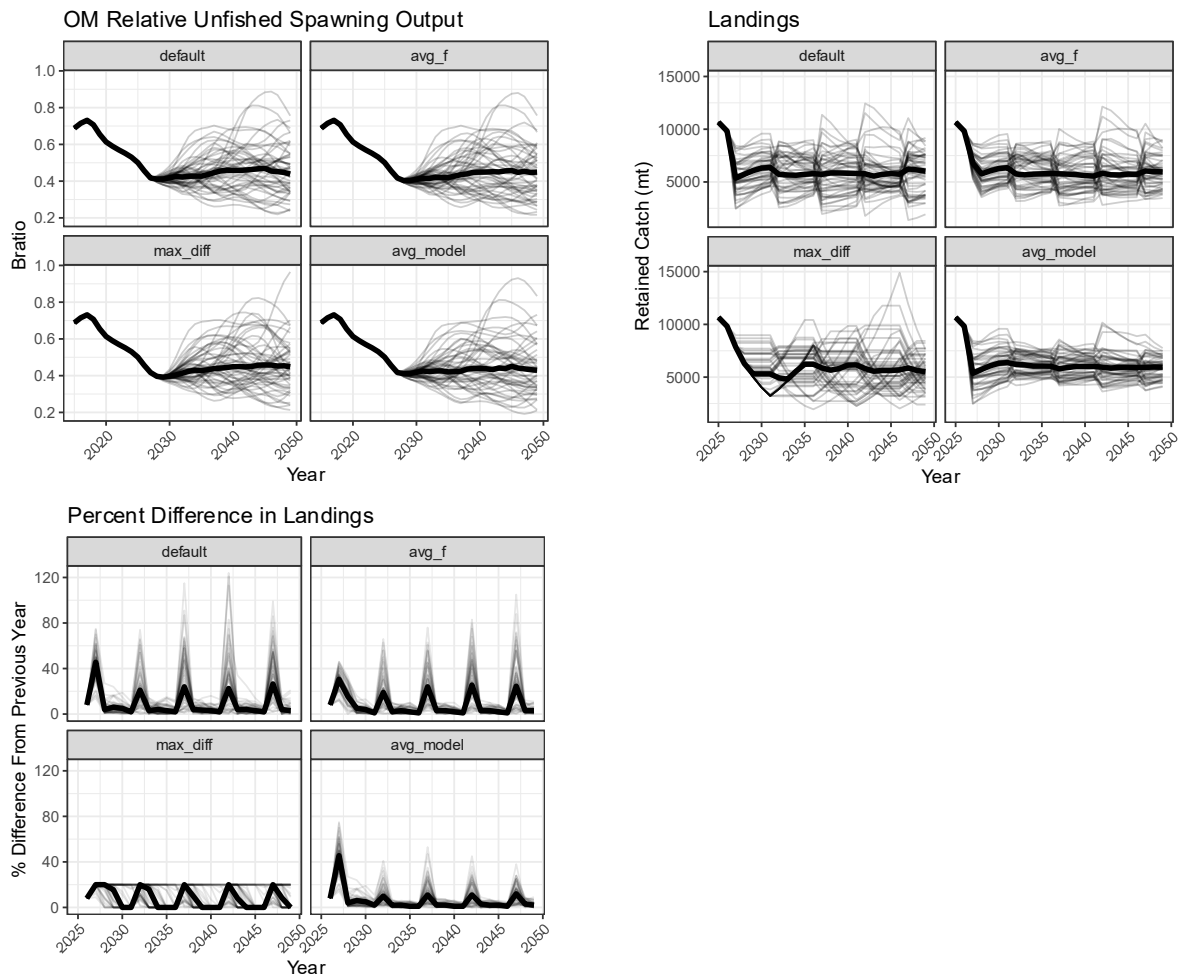


Figure 1. Simulated biomass ratio time series (top left panel), landings (top right panel) and percent difference in landings from one year to the next (bottom left panel) by control rule. The thin grey lines are the individual simulation iterations and the thick black line is the median across all 100 iterations for each control rule.

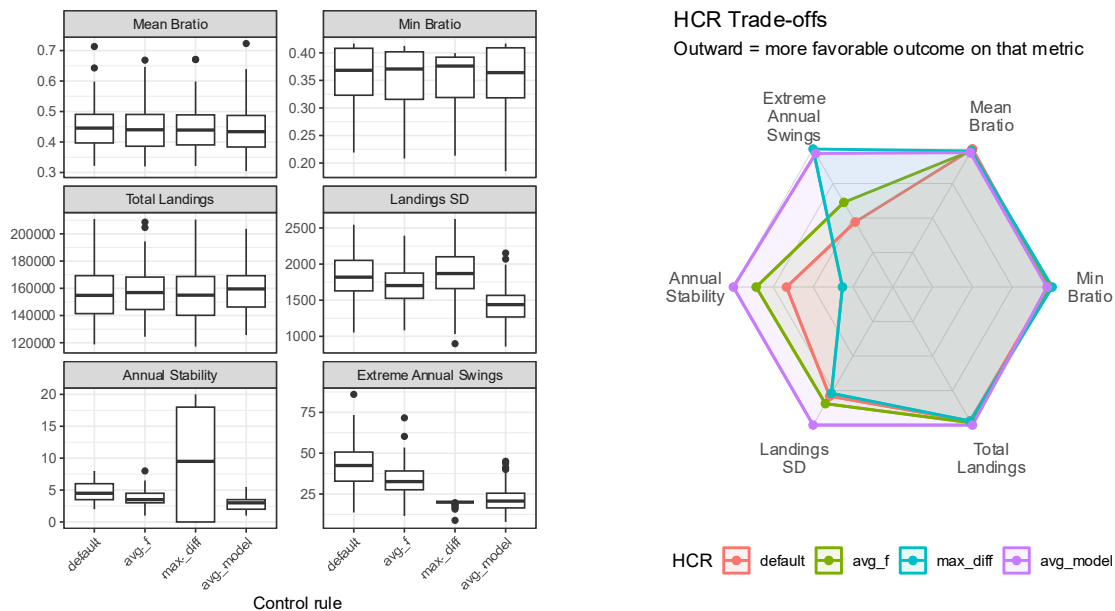


Figure 2. Two options for visualizing performance metrics results: the left panel shows boxplots which show the median (black line) interquartile range (boxes), 1.5 times the interquartile range (whiskers) and outliers (dots) and the figure on the right is a spiderplot that shows only the medians, scaled such that the best performing control rule for a given metric gets a 1 and the other control rule scores for that metric are relative to the best one. Zero is at the center and 1 at the outside of the spiderplot. The median and 95th quantile of percent differences in retained catch from one year to the next are labeled as ‘annual stability’ and ‘extreme annual swings’, respectively, on the plots.

Discussion

For the control rules and metrics we chose for this demonstration, all four rules performed equally well for stock health metrics and overall landings while the model averaging rule performed best for overall landings variability and year-to-year quota stability. If a real policy decision were at hand here, the rule with better landings stability could be chosen, given similar conservation outcomes and stated industry preference for stability and predictability.

Similar simulations could be conducted for other species of interest and across a wider range of estimation error scenarios to investigate management options under high stock assessment uncertainty. We chose here to let the EM vary randomly with respect to the OM, but scenarios should be tested where the EM systematically over-or-underestimates true abundance. Additionally, different control rules and metrics could be chosen as needed or desired by managers.