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Proceedings of the Regional Peer Review of the Guidelines on Priorities, Monitoring, and Provision of Science Advice for Small-Scale Fisheries in the Maritimes Region

Meeting dates: August 21-22, 2018 and January 30, 2020

Location: Dartmouth, NS and virtual

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

Small-scale fisheries include stocks being targeted by regular commercial fisheries where the value and volume of landings of that stock are relatively small, and where the stock has not otherwise been identified as an assessment priority. In the Maritimes Region, Fisheries and Oceans Canada (DFO) Science does not regularly assess many of these stocks, and the fishing industry plays a greater role in monitoring and assessment. This category includes stocks being developed under DFO's *New Emerging Fisheries Policy*. In the absence of stock assessments conducted by DFO, there is a need to ensure that information is available to assess and mitigate risk to these stocks.

Science advisors and resource managers from DFO met to examine the process by which science information and advice is provided to support management of secondary stocks from March 21 to 22, 2018 and on January 30, 2020. The objectives were to develop a risk framework for secondary stocks and recommendations on its use, recommend improvements to Maritimes Region procedures for providing advice on secondary species, advise on how to support industry to understand essential elements of monitoring frameworks, and advise on minimum monitoring requirements for emerging and secondary stocks. These proceedings describe the presentations and discussion that occurred during the two meetings.

INTRODUCTION

Science advice for small-scale fisheries has been managed by Fisheries and Oceans Canada (DFO) using internal guidelines developed by Maritimes Region Science in 2015 to guide the provision of science advice for fisheries management of emerging and other targeted secondary stocks (ETSS) in the Maritimes Region. Small-scale fisheries include stocks being targeted by regular commercial fisheries where the value and volume of landings of that stock are relatively small, and where the stock has not otherwise been identified as an assessment priority by the region, for example because of an important ecological role played by the stock, or because the stock has important cultural uses. All stocks being targeted by an experimental or exploratory fishery under DFO's New Emerging Fisheries Policy are considered secondary stocks in the Maritimes Region.

The overall objective of the two meetings between DFO Science and Resource Management (RM) was to examine the process for providing science advice to resource managers for secondary stocks, with additional science support and willingness from Resource Management to improve the process. The first meeting was held on August 21 to 22, 2018, and the meeting reconvened on January 30, 2020. The main objectives were:

1. Develop a risk framework for secondary species that can be used as a basis for priority setting within Science and RM.
2. Review and provide recommendations for improvements to the Maritimes Region policy and procedures for the provision of science advice for secondary species.
3. Provide advice on support that can be made available to the industry to help them understand the essential elements of monitoring and assessment frameworks.
4. Provide recommendations for using a risk framework for science advice to RM.
5. Provide advice on minimum monitoring requirements for ETSS Stocks.

The terms of reference are shown in Appendix A, and the participants for one or both meetings are shown in Appendix B. The agendas for the meetings are shown in Appendix C.

PART 1: DAY 1, AUGUST 21, 2018

Rapporteur: L. Bennett

The Chair, T. Worcester, reminded participants that the meeting was a CSAS advisory process, and so the CSAS policies and guidelines for peer review meetings were applicable.

The objectives of the meeting and its scope were reviewed by M. Greenlaw. The main objective is to determine which species are prioritized and what are the minimum requirements to provide advice to RM for decision making for small-scale fisheries. In the Maritimes Region, the term "small-scale fisheries" is used to refer to 14 species that are the target of directed fisheries but for which stock assessments have not been previously conducted (or are not conducted on a regular schedule). These stocks were previously referred to as "secondary stocks", and there was discussion about whether the term small-scale fisheries is an appropriate way to refer to them, or whether other words such as minor, micro, or data-limited fisheries would be better.

REVIEW OF PRIMARY/SECONDARY (I.E., SMALL-SCALE FISHERIES) DISTINCTION

There are seven principles and four criteria that distinguish primary from secondary stocks. Maritimes Region is the only region that has implemented this distinction, to assist Science and RM in work planning and prioritization. The criteria are similar but not identical to those used for the sustainability survey for fisheries conducted annually by DFO. A stock is considered a secondary stock if it cannot meet any of the seven principles or criteria laid out for primary stocks:

Principles:

1. Appreciable landings in the Maritimes Region
2. Appreciable landed value in the Maritimes Region
3. Subject of International agreements
4. Important Food, Social, or Ceremonial (FSC) stock
5. Important recreational stock
6. Designated a regional or national priority
7. Harvested and plays a key ecological role

Criteria:

1. Landings >2,000 t
2. Value >\$2 million per annum
3. International agreement requiring Canadian science or management
4. A keystone stock or ecologically and biologically significant stock

This list relates to commercial fisheries and does not impact work-planning for species listed under the *Species at Risk Act* (SARA). There are other criteria such as international agreements or ecological significance that would affect a stock designation. Some stocks might be assessed differently against the criteria if reviewed now; a review every three years was suggested. Also, in practice, not all primary stocks have regular stock assessments. The primary stock list represents or exceeds the current maximum capacity of DFO Maritimes Science to provide regular stock assessments. Even if a secondary stock met one of these criteria, in order for regular stock assessments to take place, a stock or combination of stocks with similar workload would have to be reduced or removed.

SECONDARY SPECIES PROCESS

S. Quigley presented an overview of the secondary species process from a RM perspective. Both Science and the fishing industry have experienced challenges fulfilling their roles as laid out in the 2015 guidelines that supported the New Emerging Fisheries Policy.

A prior meeting among resource managers to discuss file assignments and setting priorities identified the following needs:

- more discussion to identify priorities, and an approach to addressing the role of industry;
- discussion within and between the resource managers of species groupings because of the potential requirement to align effort;
- development of structures between RM and Science to facilitate discussions.

Further investigation of how other regions manage their ETSS fisheries, and greater inclusion of non-DFO science staff into the scientific assessment process, may help to identify other ways to complete this work. Expectations of the fishing industry related to the level of research and scientific understanding of their stock are also a factor in workload management.

There are systems that can be put in place in the absence of other information. The US and Australian approaches to delivering a gradient/spectrum of information products in a tiered system were mentioned. These tiers include standardized approaches for reference points for managing stocks (for example, harvest control rules).

There is a need to focus on advice for specific fisheries while indicating what would be applicable to other fisheries.

RESOURCE MANAGEMENT: POLICY CONTEXT

S. Quigley presented the emerging fisheries policy as it relates to RM. Bycatch must be considered in emerging fisheries and, therefore, indicators for directed and non-directed catch developed to address potential risks associated with the fishery. If the fishery presents a significant risk of bycatch, this needs to be identified in a monitoring plan for the emerging fishery and measures implemented to minimize and monitor the bycatch.

The need to report and to minimize bycatch exerts pressure on the fishing industry for whom those two goals may appear to be conflicted. This could create potential conflict with commercial interests. It would be helpful if the framework could consider the role that industry plays in conducting scientific data collection in the context of this issue of potentially conflicting interests between these two objectives (i.e., accurate reporting of bycatch, and efforts to minimize bycatch). Further guidance on how to ensure appropriate engagement of industry in science monitoring is needed.

SCIENCE CONTEXT

T. Worcester and K. Smedbol presented the DFO Maritimes Science context with respect to small-scale fisheries. Science capacity for stock assessment was discussed, and this was identified as a consideration in the delivery of stock assessment advice on small-scale fisheries. The role that external partnerships could play in leveraging internal DFO capacity to undertake science tasks was also discussed, with considerations of administrative overhead for partnering to be taken into account.

The demand for ecosystem-based advice on an increased number of species/stocks was identified as challenging. The role of new area-based assessments and spatial-based approaches, to provide added value in small-scale fisheries, was also discussed. Making practical progress on ETSS was identified as difficult under current conditions, which include gaps in policy guidance. The different requirements for new and emerging fisheries policy versus limited entry fishery was noted.

It was suggested that the objective for ETSS stocks should be framed as how to make robust decisions, rather than how to get the best possible data. There is an opportunity to think about informing decisions from the ground up.

Currently, there was felt to be insufficient information to advise on all the current risks. If there is not enough information, then the management response should be able to contain clear and stronger statements about risks and it should be possible to scale back the fishery to prevent collapse.

The precautionary approach (PA) provides guidance along with CSAS policies. Managers can implement practical and consistent decision-making processes. Simple and speedy options for science advice may be useful for species where sufficient scientific information is unlikely to be available to fully quantify risks. The question is how best to quantify the uncertainty and risk.

BRIEF SCOPING OF SPECIES

M. Greenlaw presented descriptions of the small-scale fisheries that were the focus of the workshop.

Sea Cucumber

The Sea Cucumber fishery provides an example of why “small-scale” is not an appropriate term given that licenses are primarily enterprise licenses. Licenses are owner-owned and operated. When one of the licensees wanted to move to new fishing areas, it was suggested that management measures could include moving to rotational (area-based) fishing with a portion set aside for reserve sites (30%). It was suggested that the fishery could conduct surveys to show that the reserve site is as productive as the fishing area. The objectives of spatial analyses (i.e., whether they are ecosystem-based analysis or economic-based analysis) need to be clearly defined. Comparisons with other fishery-independent surveys, such as the Snow Crab survey or DFO research vessel (RV) surveys, to see if there are comparable trends on those scales, was also proposed. There is a need for analytical techniques to be able to identify habitat components at various spatial scales.

Hagfish

Hagfish is a competitive fishery, with input controls. There has been resistance to establishing individual quotas or a total allowable catch (TAC). A new and emerging fishery can be competitive, but input controls are important. This is part of a larger discussion about how to provide science advice on fisheries that are controlled through effort versus total catch. For example, when there may be no direct relationship between effort-based changes and the biology of the species.

Jonah Crab

Lobster fishermen in Lobster Fishing Area 34 are allowed to keep Jonah Crab as bycatch, but the total amount retained is unknown. The retention of, and reporting requirement for Jonah Crab in this fishery were discussed.

Urchin

Formal sampling protocols for at-sea-observers (ASO) have not yet been developed. At-sea-observer coverage is problematic for this fishery, as well as for other secondary species. The current ASO requirement for this fishery is only a few trips, which are randomly selected, which may be resulting in missed opportunities. If trips are not known in advance, an observer may not be available. Typically, boats hail out as Whelk harvesting trip. They can have dedicated trips for Whelk also, and the virtual monitoring system (VMS) data for dedicated trips are recorded. In this fishery, data management is an issue for both Science and RM.

There are issues ensuring the quality of the data available to answer questions regarding management of the fisheries. Some attributes of Integrated Fishery Management Plans (IFMP) could also be useful for the secondary species. Research should support the IFMPs and the broader objectives. For a risk-based framework, any template should be structured to aid in the assessment of its efficacy. The conservation objectives for a spatial area should be considered.

More area-based objectives may be developed, and individual fisheries may need to help in achieving those objectives.

RISK FRAMEWORK METHODS

The *Data Limited Management* (DLM) tool was not considered the best tool for secondary species given the time constraints associated with the tool and the complexity associated with describing the options that were selected or rejected. Populations with high natural variability are typically riskier to manage because the ability to recover may be lower than populations with high productivity. Managing populations with high productivity is typically less risky, although high productivity species exist in a state of high variability. Species that have developed compensatory mechanisms for variability may have less inherent risk. There is an assumption that managing species with high reproductive effort is less risky, but the assumptions underlying each analysis must be defined.

The cumulative impact of fishing on a stock is a consideration, in addition to the impact of a specific fishery on another (bycatch) species.

The risk framework does not assess the risk to the species itself, and so the scoring may need additional thought. Risk scores may help to guide science work plan in addition to being used to inform advice for management. Scoring needs to be tailored to the objectives for each species. This framework could be used to triage and then elicit more information and management measures. For example, if a species was deemed high risk, a management response could be triggered. The scoring could serve as a tool to inform management measures. It could be a combination of a prioritization and advisory tool for species that are not formally assessed.

Another option is to place fisheries into categories with similar characteristics, to help guide management. A risk gradient could be used, but it would be only one factor and this approach is not yet fully developed. There is a need for qualifiers to add context, as the productivity susceptibility score (PSA) is likely to change little over time. The idea would be to keep this framework focused on data-limited species, and not include data-rich species that are considered secondary.

Management and other sources of risks (landings value, political, international agreement, legal, etc.) could be incorporated into the framework as well. Given current resource limitations, this should guide the selection of indicators of stock status. Indicators of stock status for data-limited species are fishery-based indicators that do not translate into ideal reference points, which are traditionally based on fishery-independent indicators of abundance. There is no process currently to support the development of spatial- or effort-based reference points.

Application of risk assessment framework to Monkfish

J. Sameoto presented the results of the application of a risk assessment framework to Monkfish. The fishery is resource limited but not data limited, and analyses of existing data are easier and more immediate than collecting new data. The scoping document associated with the risk assessment was considered to be useful, but more information was required about how to assess uncertainty. References should also be included in the documentation, and the average maximum age should be clarified as life expectancy.

The risk framework could be treated as question/answer and could have a third party assess and score it with a guidance document. Doing so would provide greater transparency. There is also a need to explain further (in terms of risk) what is meant by selectivity. The management risk indicators should be more clearly defined and the question rephrased as whether an assessment has been completed, rather than if there is adequate monitoring of stock status.

The terms catch and fishing effort should be clearly defined. It is unclear how to score the management and other risks categories and a guidance document on scoring would be needed.

PART 1: DAY 2, APRIL 22, 2018

The second day began with the Chair reviewing the presentations and discussion that occurred on the previous day. The questions raised during Day 1 were:

- How does Science ask management what their questions are about the stock? What are the risks and how are they determined in terms of the management decisions that need to be made? Will the status quo be sufficient? What information will be required in 5-10 years to provide advice and how will that advice be provided (peer review or simply provide the most available data)?
- Can the characteristics of the stock be used to identify where effort should be directed?
- Are we able to monitor the status of the stock?
- Can the PSA help to identify key data requirements that may be lacking for the assessments?

It was noted that science requirements may be higher for some of the emerging fisheries than for managed stocks (e.g., Pollock). The model could be used as a starting point. Other strategies are to use proxies (indices) that appear appropriate or use the wisdom of an expert group to develop advice. Another question is what should be accepted as a fishery-independent survey, for example, is the RV survey a better survey for monitoring Pollock than for Monkfish. Various data sources should be reviewed for their ability to provide abundance indices.

Sometimes there is not enough known about the biology of a species to state the appropriate decision or question. The geographic scale and scope of the question should be considered. If the information is required on a small-scale, then broad scale surveys won't be useful for answering the question.

The following elements should be considered when prioritizing the work required: what information is available on the life-history (reproductive strategy, life span); best methods for working with the information available even if it is not very good. For example, use the RV survey to provide information on Jonah Crab.

Determine which of the 14 stocks are at highest risk, whether there have been changes in fishing levels, interactions with other fisheries and political risk.

Evaluation of the quality of data for all 14 stocks is not yet possible because we don't have information compiled yet on the extent of data that are available. A thorough examination would be required before suggesting this be used as an index. The fishery must also be understood to determine whether the index is applicable. For this discussion, it would be helpful to focus on the step that occurs before evaluating the data. Latent effort, change areas, geographic scale, could be used to prioritize. The characteristics of the fishery may prioritize risks and the direction in which effort should be applied moving forward.

APPLICATION OF RISK ASSESSMENT FOR SMALL-SCALE FISHERIES

M. Greenlaw presented an application of the risk assessment for small-scale fisheries. The cut off points used in the PSA are not for Canadian species. The curves have been adjusted to fit US species but could be modified for Canadian species. Each management unit may need to be considered separately when scoring it for the PSA. Susceptibility alone would not be sufficient to use on its own since there is a clustering on the x-axis. The traffic light approach may be

applicable because it brings in other criteria. The risk assessment approach aggregates a lot of the information together, unlike a traffic light approach (expert opinion approach). There were two approaches possible: in one, the science advisor completes the PSA and the other is the traffic light approach that uses expert opinion.

If an expert opinion approach were used for the assessment, it would be helpful to have the summary provided by the PSA approach as it is a good communication tool. This could be an evolving issue with rankings adjusted based on new pressures. The frequency of review would need to be considered. If the focus is on things that can change quickly, reviews would occur more frequently. If this informs a CSAS request, an annual check-in would be required.

The traffic light approach includes risks that will direct effort, e.g., political risk and the approach should be designed to capture potential risk. Initially, the criteria would be kept partitioned. Until a traffic light is developed, it won't be known what criteria can be grouped together and what can be dropped. Scoring may not identify the one highest risk since the highest risk is 3. There is the potential for low contrast since there are a lot of unknowns and they would all be scored as 3. There could be aggregation of criteria and addressing them individually might not be manageable. Non-linearity in components must be considered as well as identifying data collection and assessment priorities. It is possible that the scores of individual sections (productivity, susceptibility, ecological considerations, etc.) could be examined and placed in different categories.

One of the challenges is how to treat uncertainty. Should it be left as blank or scored as a 3? Uncertainty is high risk not because of known risks but because of a lack of information. The probability or evidence of change should be included as a criterion and early identification is important. This initial discussion is on how to provide advice now with current knowledge and there should be future discussion later on the long-term needs.

Using the risk assessment to provide science advice to resource managers

It was suggested that the participants consider what is possible in the management realm and to determine where to direct effort that have been identified as high risk. It was felt that management considerations should not guide the assessment; the risk assessment should be completed first and the management ability to respond should be used as a second layer since it comes down to what is attainable and achievable. Perhaps management consideration should be included within the minimum standards.

The risk assessment tool did not appear able to address several key questions. For example, does the tool differentiate between corporate and owner-operated fisheries, is the fishery controlled through input versus output control, or passive vs active gear? There is a long list of secondary species that will have multiple advisors and the tool must be useable by a variety of people. It would be helpful to have the screening template completed for all the 14 species with a quick method for prioritization and management use. It was suggested that the minimum requirements be completed by DFO Maritimes Science.

It was also suggested that management risk questions be altered with consideration as to whether management measures are appropriate for the stock. For example, considering the smallest amount of biological information that would be sufficient and what factors would distinguish between species. The biology of the species becomes important in consideration of the fishery characteristics, which determine the extent that it is vulnerable to overfishing. The questions from the template should be added to the PSA analysis, since it provides context to the analysis. Those questions should be reviewed and edited as necessary to remove redundancy. The questions could be merged into the analysis. The idea would be to focus on flushing out management risk given the correlation of biological components.

Review of Productivity Susceptibility score criteria

Susceptibility Risk

1. Overlap of species range with fishery- combine with #2
2. Species has small or restricted range
3. Habitat overlap
4. Depth overlap

Does the fishery overlap with stock and can fishing gear reach the habitat within the range? These two questions could replace the first four criteria and be scored as high, medium or low.

1. Selectivity - gear type: proxy for size range available to the fishery. REMOVE, likely no information.
2. Post-capture mortality – this may not be useful in the initial screening but is important in the next step. Need to decide how to treat the unknowns. KEEP
3. Size at maturity vs size at first capture. KEEP, but replace with capturing juveniles with a scoring range. Include something related to maturity and capture.
4. Behaviour that makes it vulnerable to fishing pressure: aggregates, site fidelity, attraction to gear. KEEP

A criterion related to the ratio of landings/removals to bycatch should be added under management risk.

Management Risk

1. Adequate monitoring of stock status with at-sea observers, fishery dependent survey, catch data, independent survey Remove the word “adequate” and add “has the data been validated”. Scoring is about confidence in the index not the dependent source of the data.
2. Adequate monitoring of catch and fishing effort. Add “has the data been validated for both catch and effort” questions. Separate catch and fishing effort into two separate questions. Catch monitoring should be the highest priority. Catch is considered removals and discards. Split catch into landings and discards.
3. Species is/was overfished with inadequate recovery plan: could be here or elsewhere. Remove recovery plan portion.
4. Excess capacity in the fishery. This refers to latent effort and potential for emerging market - REMOVE.

General comments included that the process could be applied more broadly, with different scoring categories for data rich species. A question should be added about the monitoring of discards. The habitat impacts of catching other species in targeted fishery could be captured in other risks category. For the next round of analysis, add questions regarding fished versus unfished licenses and landings relative to TAC. Also, whether a question should be added regarding fishing controls (input-output controls).

Productivity Risk

This would not be included due to the length of time they will take in the initial analysis but will be considered in the next round of analysis. These would include:

1. Average age at maturity
2. Average max age

-
3. Fecundity
 4. Average max size
 5. Average size at maturity
 6. Reproductive strategy
 7. Trophic level - proxy for rate of increase
 8. Species exhibiting high natural population variability that may be driven by broad scale environmental changes

Other Risk

1. Landing value (2016)
2. Landings
3. Political risk - Include
4. Species listed by COSEWIC or DFO
5. Subject of international agreement
6. Important Food Social Ceremonial species
7. Important Recreational species
8. Designated a regional or national priority - Include
9. Harvested and plays a key ecological role - Include
10. Legal risk
11. Bycatch concerns
12. Interaction with other species

Risk and priority are two separate things that need to be recognized.

General Fishery Characteristics

Discussion focused on which of the following fishery characteristics should be carried over for this first analysis.

1. Sub-fisheries: no
2. Sub-fisheries assessed: no
3. Start date/history: no
4. Geographic extent of fishery: no
5. Regions or zones within the fishery: no
6. Fishing season: no
7. Target species and stock status: no
8. Bait collection and usage: no
9. Current entitlements: no
10. Current and recent TACs, quotas trends by methods: no
11. Current and recent fishing effort trends by methods: no

-
12. Current and recent fishery catch trends by methods: no
 13. Current and recent value of fishery: has some potential to be carried over
 14. Relationship with other fisheries
 15. Fishing gear and methods:- no
 16. Fishing gear and restrictions: no, clarification needed
 17. Selectivity of gear and fishing methods: no
 18. Target species issues: needs clarification
 19. Bycatch and bycatch issues and interactions: no
 20. Discarding: no
 21. Management objectives: no
 22. Fishery management plan: no
 23. Input controls: no
 24. Output controls: no
 25. Initiatives and strategies
 26. Data: no (replace with quantify uncertainty)
 27. Logbook data: no
 28. Observer data: no
 29. Other data: no

NEXT STEPS FOR RISK ANALYSIS

With a reduced list, M. Greenlaw can work on the risk analysis. This would be followed by a process for scoring and discussion among a smaller group on how to proceed. In the end, the entire group may have to reconvene to review the scoring and outcomes. In the short-term, M. Greenlaw will coordinate with the management team to generate short-term priorities and then propose a meeting of the entire group to look at the longer list and prioritization.

Proposals

It was proposed that scores be aggregated by taking the average of all the components, that is, the scoring should have equal weighting for now. A traffic light approach would be used to score the management criteria for the first assessment. It should be done in a way to see whether clumping could be observed. Different methods could be applied to which ones worked. We could bring this back at a later date, and it might become obvious when the analysis is complete. There was concern that by averaging the values within each category, we are implying that each criterion should be given equal weight when that has not yet been the consensus of the group.

Recommendations to Update Policy and Procedures for Science Advice for Secondary Species

There was discussion about whether DFO Maritimes Science could do more with respect to basic monitoring and leveraging industry to do additional work. Changes to work commitments would have to be discussed by Science Branch management.

Concerns with asking the fishing industry to help analyze scientific data, in addition to the support and guidance required, were raised. The level of review required for each species and the time scale would have to be determined. There is an opportunity to state what has or has not worked in the past, and the risks. DFO Science will keep getting requests to provide information and advice on these stocks, so the approach in the absence of such a framework should be considered.

The (trigger) for initiating a CSAS advisory process, and when formal or informal delivery of advice is best, also has to be addressed. Privacy concerns must be considered, and templates developed for industry. Review of standard science protocols do not necessarily need to go through CSAS, but advice relating to management decisions and decision points must be documented. Small-scale fisheries deserve a thorough evaluation at some point. Peer reviewed information often carries more weight than expert opinion even if the results are similar. The assessment should consider the following:

1. What can we say about the acceptability of the status quo? If unable to answer it, what are the critical gaps that need to be addressed?
2. What advice need to be completed before the next review?

There is a need for a realistic scheduling of the work. Hagfish is a good example of what can be done with limited information.

How will science advice be developed?

1. The annual reporting component needs to be determined.
2. Do we do a few things well?
3. Work toward a multi-year assessment schedule.

Many of these species have insufficient data to conduct an assessment. Minimum monitoring requirements for the assessment must be set up and a plan developed for how to proceed in the interim. There was a suggestion that the structure of the fishery could be considered with DFO Maritimes Science capacity focused on owner-fished species rather than operator-fished species. The former category has more capacity to gather data.

Participants were welcomed to review and provide comments, to reflect the current state of affairs with respect to capacity and knowledge, recognizing that DFO Science will be contributing to the science collection and work. The framework that resulted from this meeting, recommendations and possible solutions are summarized in Appendix D.

PART 2: JANUARY 30, 2020

The meeting Chair, T. Worcester, reviewed CSAS meeting guidelines and reminded participants that this meeting was a CSAS workshop. This meeting forms part 2 of the workshop that was held in August 2018.

M. Greenlaw presented a review of the last meeting. Fourteen species were identified as secondary. This workshop focused on the applicable species and the criteria between primary and secondary species. It was not clear as yet how the new *Fisheries Act* provisions would influence the definitions of primary and secondary species.

The presentation was divided up with the aim of identifying the problems and making recommendations on how to address them.

PROBLEM 1

It took a long time to work through the 14 species and it was difficult to determine what level of review each species should get, and on what time scale. It is recommended that a multi-year 'framework' schedule be developed for secondary species based on the Risk Analysis and yearly updates completed outside CSAS process, through advisory committee meetings. Another recommendation is to use the modified risk analysis to identify priorities. This will require a triage approach to narrow down the list of questions to ask and then perform the risk assessment. These two recommendations focus on creating the idealized version of the process.

The updates have been really good outside the CSAS process, and has worked, but as new proposals come in, Science advice is needed. Quick updates before advisory committee meetings are very useful, but there is need to determine what would be realistic for a particular species. Also need advice on spatial management, e.g., the identification of reserves.

PROBLEM 2

It has been difficult for RM and fishing industries to meet their roles as set out in the guidelines document for secondary species (2015). The model of industry perfuming the monitoring and reporting does not appear to be working well. It is recommended that the roles in the document 'Emerging and Other Targeted Secondary Stocks in the Maritimes Region: Guidelines for the Provision of Science Advice for Fisheries Management' be updated. Also, if feasible, the Secondary Species Unit could provide a limited amount of indicator and reference point development. They could also assess risk for fisheries that are already commercial (by following any Fish Provisions guidelines developed nationally).

All fisheries are now grouped together, but we need to recognize that new fisheries may need different approaches. There is need for a template or guidance for what to do with new species, for example, development of monitoring plans. The risk assessment framework should provide guidance on what RM could do in these cases. These recommendations could go to senior management before allowing new fisheries.

There is a need to define what sort of indicators would be required and guidance on what science elements could be included in proposals. Information on the ecological role of the species would be required. Consensus on roles and responsibilities would be required and developed outside of this workshop. It would be beneficial to try to have academic involvement to focus on part of what is required. This would require targeting questions to be answered and exploring opportunities for partnerships, such as industry-DFO partnerships and DFO-academic partnerships.

PROBLEM 3

How to set up a more precautionary approach for managing species with a limited amount of information. National guidance is coming from Bill C-68 and workshops on data-limited species.

Management responses to these types of fisheries could contain stronger statements about risks, with options for scaling back of fisheries to address concerns.

PROBLEM 4

There is need for guidance on what the minimum requirements are to move a new exploratory fishery to commercial. The recommendation is to have another CSAS process on this particular question, specifically for Emerging and Exploratory Fisheries.

MODIFIED RISK ANALYSIS TABLE

This table is based on expert opinion and should be consistent with what we would expect. The species that are high risk are at the top of the list. The ones that have little information/data come out on top. Sculpin is low because it is only focused on the Saint Mary's Bay area and not the entire Scotian Shelf. The population as a whole, however, appears to be declining. Cod comes out higher than expected. Herring is identified as low risk because the management risk is considered low (i.e., is heavily influenced by the management risk). Data from monitoring when available should also influence risk (i.e., the risk should be greater where there is less data). For the high-risk species, there is less data and less knowledge. It was suggested that the all the fishery monitoring items in the table be collapsed to one (average one score). The other suggestion is that categories could be weighted differently.

The table is focused mainly on marine fish (animal) species; however, it may be possible to look at the questions and see if they can be made to be generic so that they can be applied to marine plants also. There is need for a category on life-history information to address productivity. In such a case, consideration would be given to long turnover versus short turnover time for life-history. A category for vulnerability of the species is needed in the table.

APPENDIX A.1: AUGUST 21-22, 2018 TERMS OF REFERENCE

Guidelines on Priorities, Monitoring, and Provision of Science Advice for Small-Scale Fisheries in the Maritimes Region

Regional Peer Review – Maritimes Region

August 21-22, 2018

Dartmouth, Nova Scotia

Chairperson: Tana Worcester

Context

Small-scale fisheries include stocks being targeted by regular commercial fisheries where the value and/or volume of landings of that stock are small relative to other fisheries. In the Maritimes Region, DFO Science does not conduct stock assessments for many of these stocks, and the fishing industry is expected to take a greater role in monitoring and assessment. This category also includes stocks being developed under DFO's *New Emerging Fisheries Policy*. In the absence of stock assessments conducted by DFO, there is a need to ensure that sufficient information is available to assess and mitigate risk to these stocks.

DFO Science and Resource Management (RM) have expressed interest in reviewing how DFO Science might provide advice on small-scale fisheries and/or support the fishing industry in developing science information on these stocks. Additionally, RM has requested advice from Science on minimum monitoring requirements for small-scale fisheries in order to assess risk.

Objectives

1. Develop a risk framework for small-scale fisheries that can be used as a basis for priority setting within Science and Resource Management.
2. Review and provide recommendations for improvements to the Maritimes Region policy and procedures for the provision of science advice for small-scale fisheries.
3. Outline what support DFO can provide to industry to develop monitoring or assessment frameworks
4. Provide recommendations for using the Risk Framework for Science Advice to Resource Management.
5. Provide advice on minimum monitoring requirements for small-scale fisheries.

Expected Publications

- Proceedings

Expected Participation

- Fisheries and Oceans Canada (DFO) (Science and Fisheries Management sectors)

APPENDIX A.2: JANUARY 30, 2020 TERMS OF REFERENCE

Guidelines on priorities, monitoring, and provision of Science Advice for Small-Scale Fisheries in the Maritimes Region: Part 2

Regional Peer Review – Maritimes Region

January 30, 2020

Via WebEx from St. Andrews

Chairperson: Tana Worcester

Context

Science advice for small-scale fisheries has been managed using the guidelines for the provision of Science Advice for Fisheries Management for Emerging and Other Targeted Secondary Stocks in the Maritimes Region (DFO 2015). Small-scale fisheries include stocks being targeted by regular commercial fisheries where the value and volume of landings of that stock are relatively small, and where the stock has not otherwise been identified as a priority by the Region, for example because of an important ecological role played by the stock, or because the stock has important cultural uses. As such, all stocks being targeted by an experimental or exploratory fishery under DFO's New Emerging Fisheries Policy are secondary.

The overall objective is to examine the process for providing science advice to Resource Management for these stocks, with additional Science support and willingness from Resource Management to improve the process. The first meeting was held on August 21-22, 2018. The purpose of this January 30, 2020 WebEx meeting is to complete the discussion on the objectives.

Objectives

1. Develop a risk framework for secondary species that can be used as a basis for priority setting within Science and Resource Management.
2. Review and provide recommendations for improvements to the Maritimes Region policy and procedures for the provision of science advice for secondary species.
3. Provide advice on support that can be made available to the industry to help them understand the essential elements of monitoring and assessment frameworks.
4. Provide recommendations for using the Risk Framework for Science Advice to Resource Management.
5. Provide advice on minimum monitoring requirements for ETSS Stocks.

Expected Publications

- Proceedings

Participation

- Fisheries and Oceans Canada (DFO) Science Branch, Resource Management

APPENDIX B: LIST OF PARTICIPANTS

Participant	Affiliation
Alida Bundy	DFO Science
Jennifer Ford	DFO Resource Management
Tara McIntyre	DFO Science
Michelle Greenlaw	DFO Science
Mark Wilcox	DFO Resource Management
Kent Smedbol	DFO Science
Tim Hayman	DFO Resource Management
Sara Quigley	DFO Resource Management
Heath Stone	DFO Science
Leslie Nasmith	DFO Science
Jessica Sameoto	DFO Science
Rabindra Singh	DFO Science
Kathryn Cooper MacDonald	DFO Resource Management
Suzette Soomai	DFO Resource Management
Christa Waters	DFO Resource Management
Heather Bowlby	DFO Science
David Keith	DFO Science
Don Clark	DFO Science
Irene Andrushchenko	DFO Science
Ryan Martin	DFO Science
Rob Stephenson	DFO Science

APPENDIX C.1: AUGUST 21-22, 2018 AGENDA

Day 1

Time	Subject	Presenter
830	Welcome and Introductions Housekeeping CSAS Overview and Procedures	Chair
900	Meeting Objectives	M. Greenlaw
920	Overview of Primary/Secondary distinction	M. Greenlaw
940	Review of Secondary species Process	S. Quigley
1030	Break	
1045	Relevant Policies in Science and RM	T. Worcester and K. Smedbol/ S. Quigley
1130	Brief Scoping of Small-Scale Fisheries	M. Greenlaw
1250	Group Discussion	Group
1215	Lunch Break	
1315	Overview of Risk Assessment Methods	M. Greenlaw
1330	Possible Risk Assessment Components	M. Greenlaw
1400	Group Discussion	Group
1430	Application of Risk Assessment to Monkfish	TBA
1500	Application of Risk Assessment to Small-Scale Fisheries	M. Greenlaw
1600	Group Discussion	Group
1630	Adjourn for the Day	

Day 2

Time	Subject	Presenter
830	Overview of Day 1	Chair
900	How can we use the Risk assessment to provide Science Advice to RM	M. Greenlaw/Group
1030	Break	

Time	Subject	Presenter
1045	Provide Recommendations to update Policy and Procedures for Science Advice for Secondary Species	M. Greenlaw/S. Quigley & Group
1215	Lunch Break	
1315	Supports that can be made available to industry to understand monitoring and assessment frameworks	Group
1345	Advice on setting minimum monitoring requirements	M. Greenlaw/Group
1430	Break	
1445	Develop work plan/advice plan for Small-Scale Fisheries	Chair
1600	Wrap up	
1630	Adjourn	

APPENDIX C.2: JANUARY 30, 2020 AGENDA

Time	Subject	Presenter
100	Welcome and Introductions Housekeeping CSAS Overview and Procedures	Chair
115	Meeting Objectives and Review of last meeting	M. Greenlaw
145	Items requiring discussion 1	M. Greenlaw
215	Group Discussion	Group
245	Break	
300	Items requiring discussion 2	M. Greenlaw
330	Group Discussion	Group
410	Consensus Statements Advice for Small-Scale Fisheries	Chair
425	Wrap up	
430	Adjourn	

APPENDIX D: 2019 UPDATED GUIDELINES ON PRIORITIES FOR SECONDARY SPECIES

Priorities, Monitoring, and Provision of Science Advice for Small-Scale Fisheries in the Maritimes Region

Context

A CSAS Workshop was held on August 21-22, 2018 to discuss guidelines for developing priorities, monitoring and providing science advice for data-limited/low-value/secondary species in the Maritimes Region. Science advice for these fisheries has been managed using the guidelines for the provision of Science Advice for Fisheries Management for Emerging and Other Targeted Secondary Stocks in the Maritimes Region (DFO 2015). These fisheries include stocks being targeted by regular commercial fisheries where the value and volume of landings of that stock are relatively small, and where the stock has not otherwise been identified as a priority by the Region, for example because of an important ecological role played by the stock, or because the stock has important cultural uses. As such, all stocks being targeted by an experimental or exploratory fishery under DFO's *New Emerging Fisheries Policy* are secondary. The workshop was limited to the group of 14 species covered under data-limited, targeted fisheries, as such, by-catch were not included in the discussion.

It was discussed that although originally, the cut-offs of 2000 mt and 2 million dollars were included as a distinction between primary and secondary species, these fishery values and landings have increased to encompass anything that falls under 5 million dollars and having landings of 3000 mt. We do not expect the list of secondary stocks to change, without additional resources to move a secondary stock to a primary stock.

This document is a summary of the resulting risk framework, recommendations from the meeting including possible solutions to problems identified.

Meeting Objectives

Describe a risk framework for secondary species that can be used as a basis for priority setting within Science and Resource Management.

Review and provide recommendations for improvements to the Maritimes Region policy and procedures for the provision of science advice for secondary species.

Provide advice on support that can be made available to the industry to help them understand the essential elements of monitoring and assessment frameworks.

Provide recommendations for using the Risk Framework for Science Advice to Resource Management.

Provide advice on minimum monitoring requirements for ETSS Stocks.

Secondary Species

Secondary species are made up a large number of species (14) with a diversity of life histories, distributed over a wide geographical area, subject to various modes of fishing. There are limited resources for monitoring within DFO and within the secondary species fishing industry.

Role of Secondary Species

Species included within Secondary Species.

Secondary Species Risk Assessment

A modified and streamlined version of the Hobday et al. (2011) Productivity Susceptibility Analysis (PSA) was chosen for the Secondary Species Risk Assessment (Table A1). This method was chosen to provide a flexible semi-quantitative approach to evaluate the risk of data-limited fisheries identify priorities within Maritimes Region. Similar risk frameworks have been developed and widely applied (Stobutzki et al. 2001, Hobday et al. 2007) in response to legislated acts such as the US Magnuson-Stevens Fisheries Act and the Australian Environmental Protection and Biodiversity Conservation Act (1999). The PSA analysis was originally used to evaluate bycatch species, but in recent years it has increasingly been applied to determine risk for targeted fish stocks (e.g., Rosenberg et al. 2009). Similarly, to establish risk the Marine Stewardship Council Certification (MSC) also uses a version of the PSA analysis to assess fisheries for MSC Certification. The benefits of using this method over others is that it can rapidly assess a large number of species, it is simple and easy to use, and it is easy to translate to RM and develop risk-based language. Studies have shown the PSA is precautionary compared to other methods (i.e., SAFE, and also compared to results of quantitative stock assessments for data-rich stocks).

The goal of applying the risk assessment to the secondary species covered by this document is to prioritize fisheries for the Secondary Species Unit, and the CSAS process. Secondary species covered by this document are considered data limited. A risk framework was identified to help guide science advice and work planning for secondary species, with application to other fisheries. An initial approach was presented, based on the PSA developed by Hobday et al. (2011) at the CSAS Workshop in August 2019. During the meeting, the approach was modified and streamlined. A modified risk framework was identified, based on the PSA (Table A1). The scoring outcomes for secondary species in the Maritimes Region are shown in Figure A1 and Tables A2, A3 and A4.

The method does have criticisms, including that there has not been a lot of testing to evaluate which criteria are most important and its predictive capacity. It has been called overly simplistic. There are many ways of calculating productivity, susceptibility, and overall vulnerability scores (e.g., geometric mean, arithmetic mean). There are questions around what to do with missing information. There are likely highly correlated variables included (which we have tried to remove by modifying the approach to suit DFOs needs). Also, there is little evidence in fisheries literature to suggest that vulnerability of a population is a linear function of productivity and susceptibility.

Why did we choose this risk assessment?

Although MSY-based models may initially be assumed to be the preferred approach for assessing these species, they are not applicable because natural mortality rates or population growth rates and virgin biomass are unavailable.

Use the risk framework to triage species and designate priorities. What approach is going to be used if a species is deemed high risk? Is it going to trigger a management response? Is this a tool to inform management measures?

Guidance document on scoring needed

How do we incorporate the risk framework for the fishery that has been developed at a national level to this? Possibly do both of the risk analyses and compare and contrast them to what they would provide for secondary species.

The risk framework helps to identify key data requirements that may be lacking for the assessments. How do we incorporate the monitoring tool assessment into this from a national approach? The national risk assessment for fisheries would not work for secondary species as it incorporates stock status, reference points, mortality, and mortality of discards which is

information we do not have for secondary species. Although it is a lot more onerous, and the monitoring tool assessment might take a little while for each species it might guide us after we've developed the risk framework to work towards the best monitoring plan for each species. There is potential we could use this for the Whelk science advisory process coming up, for letting us know what the gaps are. But we also need to establish thresholds for moving to a commercial fishery from an exploratory fishery.

How are the dependability score thresholds from the meeting going to advise on whether we should move the fishery from exploratory to commercial?

The challenge with the national approach overall is that we will not be able to use it for species that don't have defined reference points, and those are inherently more vulnerable. How do we deal with fisheries that don't have enough data to fill out the risk screening tool automatically?

No information got a high risk score 3.

Risk

Formula for calculating risk is the square root of Productivity + Susceptibility² + Management Risk².

Table A.1. Modified risk assessment of secondary species for priority setting in the Maritimes Region.

Risk Score	High Risk (score = 3)	Med. Risk (score =2)	Low Risk (score =1)
Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity
1. Overlap of species range with fishery.	70 - 100%	30-70%	<30%
2. Can fishing gear reach the habitat within range (habitat and depth) e.g., vertical structure refuge, depth range refuge, etc.	High species habitat and depth overlap with fishing gear	Medium species habitat and depth overlap with fishing gear	Low species habitat and depth overlap with fishing gear
3. Discarding and Post-capture mortality.	High discarding and high post-capture mortality	Moderate discarding (20-40%) and moderate post-capture mortality	Low discarding and low discard mortality
4. Are you capturing juveniles?	Size at maturity above size at first capture, or no information	Size at maturity matches size at first capture	Size at maturity well below size at first capture
5. Behaviour that makes it vulnerable to fishing pressure: aggregates, site fidelity, attraction to gear.	Spawning aggregates are fished, sedentary species, or aggregates all year	Aggregates, but not fishing during aggregation	Dispersed
6. Species is/was overfished.	Critical Zone	Cautious Zone or Healthy Zone, or never assessed	Always in Healthy Zone
Management Risk	Management Risk	Management Risk	Management Risk
1. Validated monitoring of stock status	None	Reliable indicators (catch rates, l/f)	High quality fishery independent survey data
2. Logbooks - effort	No effort recorded	Some concern about accuracy of effort, accuracy of spatial location	Spatial location recorded, effort recorded accurately
3. Catch Monitoring	Average of below	Average of below	Average of below
3a. Observer Coverage	Little/no coverage, years missing, cluster sampling, never assessed, targets not achieved, missing units of target population, etc	Low amount of coverage (1- 15% per year), coverage for a medium proportion of the target population 20- 50%	High amount of coverage > 20%, or other validated percentage. Coverage for a high proportion of the target population >50%
3b. Port Sampling	0%	5%-19%	19%-100%
3c. Dockside Monitoring	0%	20%-50%	50%-100%
3d. VMS	No	-	Yes
5. Bycatch of species in other fisheries	Expected to be high, = or more than directed fishery with no data recording	No data recording, but expected to be 20% or less than catch in directed fishery	Little to no expected bycatch in other fisheries
Other Risk-Modifier	Other Risk-Modifier	Other Risk-Modifier	Other Risk-Modifier
1. Political Risk – maintain confidence of stakeholder groups	Negative Regional media attention, public conflict with another Federal or Provincial Department, Federal inquiry request	Public or industry pressure for action on management decisions	Minor political, public, industry risk
2. Designated a regional or national priority	Departmental obligations, sectoral priority	Regional importance	Non-critical, program level objectives

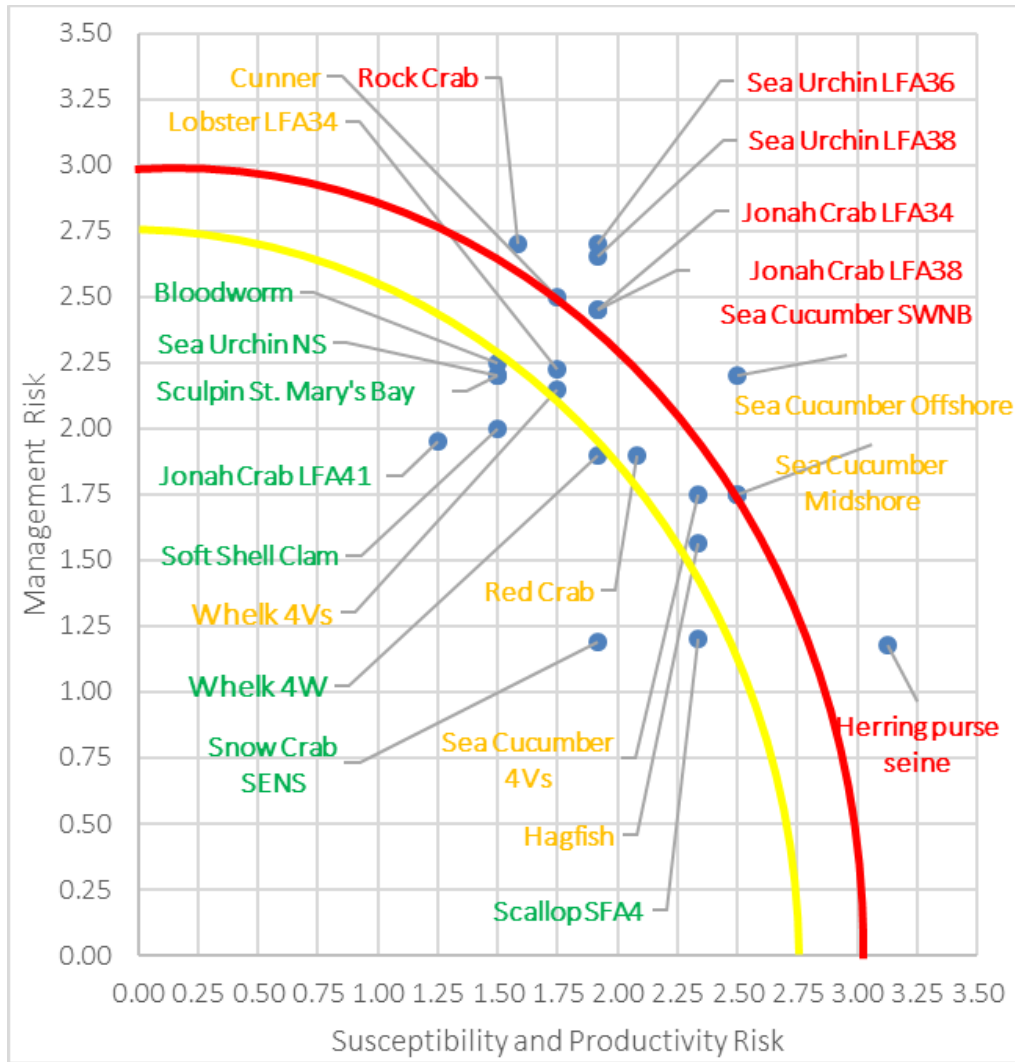


Figure A.1. The outcome of the risk assessment for Secondary Species for priority setting in the Maritimes Region. Items identified in red are categorized as High Risk, while Orange are categorized as Medium Risk, and green items are categorized as Low Risk.

Table A.2. Risk assessment outcomes for Secondary Species. The table is ordered by the 'Total' column, which presents the 'Productivity & Susceptibility' and "Management Risk" combined, while the 'Total + Modifier' column adds additional risk, including political risk and species designated Regional and/or National priorities.

Risk	Fishery	Prod. + Susc.	Manag.	Other Risk - Modifier	Total	Total + Modifier
High Risk	Sea Urchin LFA36	1.92	2.69	1	3.30	4.30
High Risk	Sea Cucumber SWNB	2.50	2.13	1.5	3.28	4.78
High Risk	Sea Urchin LFA38	1.92	2.63	1	3.25	4.25
High Risk	Rock Crab	1.58	2.69	1	3.12	4.12
High Risk	Jonah Crab LFA34	1.92	2.44	1.5	3.10	4.60
High Risk	Jonah Crab LFA38	1.92	2.44	1	3.10	4.10
Medium Risk	Cunner	1.75	2.50	1.5	3.05	4.55
Medium Risk	Sea Cucumber Mid-shore	2.50	1.67	1	3.00	4.00
Medium Risk	Sea Cucumber Offshore	2.50	1.67	1	3.00	4.00
Medium Risk	Sea Cucumber 4Vs	2.33	1.67	1.5	2.87	4.37
Medium Risk	Red Crab	2.08	1.88	1	2.80	3.80
Medium Risk	Whelk 4Vs	1.75	2.13	1.75	2.75	4.50
Medium Risk	Hagfish	2.33	1.46	1.5	2.75	4.25
Low Risk	Bloodworm	1.50	2.25	1	2.70	3.70
Low Risk	Whelk 4W	1.92	1.88	1.5	2.68	4.18
Low Risk	Sea Urchin NS	1.50	2.19	1	2.65	3.65
Low Risk	Sculpin St. Mary's Bay	1.50	2.13	1.5	2.60	4.10
Low Risk	Softshell Clam	1.50	2.00	1	2.50	3.50

Table A.3. Verbal description of the risks identified for Secondary Species using the modified Risk Assessment procedure.

Risk Category	Fishery	Issues
High Risk	Sea Urchin LFA36	Dive and drag fisheries extracting all habitat depths, high percentage of discarding, no indicators of stock status, no effort recorded, no logbook positions recorded, little catch monitoring (no observer, port sampling, low dockside monitoring rate, no VMS)
High Risk	Sea Cucumber SWNB	Evidence that stock is overfished, aggregates, fishing majority of species range, concerns with logbook data and effort recording, likely capturing juveniles
High Risk	Sea Urchin LFA38	Similar to Sea Urchin LFA36 above, except has 100% DMP rate
High Risk	Rock Crab	Baited traps, no stock status indicators, effort not scrutinized. No observer coverage, port sampling, little dockside monitoring and no VMS. Possibility of high bycatch in other fisheries including Lobster.
High Risk	Jonah Crab LFA34	Ability for fishing gear to reach the entire depth range, species was overfished in LFA 41 and did pretty poorly for a while in LFAs 34 and 38, no stock status monitoring, extreme bycatch of species in the lobster fishery, some political risk associated with bycatch in the lobster fishery
High Risk	Jonah Crab LFA38	Ability for fishing gear to reach the entire depth range, species was overfished in LFA 41 and did pretty poorly for a while in LFAs 34 and 38, no stock status monitoring, extreme bycatch of species in the lobster fishery, some political risk associated with bycatch in the lobster fishery
Medium Risk	Cunner	A lot of unknowns: species range. No inshore surveys, life history data unknown, or unresearched. No indicators of stock status, no explicit catch monitoring within the lobster fishery until the data have been worked up, usefulness of data from the industry have not been assessed
Medium Risk	Sea Cucumber Mid-shore	Fishing entire of range within fishing area, no monitoring of validated indicator/indicator problems, aggregates, no refuge habitat, likely capturing juveniles
Medium Risk	Sea Cucumber Offshore	Fishing entire of range within fishing area, no monitoring of validated indicator/indicator problems, aggregates, no refuge habitat, likely capturing juveniles
Medium Risk	Sea Cucumber 4Vs	Fishing gear accessing large amount of species range, 30% set aside as protected, species aggregates, no validated stock status monitoring, observer coverage not useful, why don't they have VMS?
Medium Risk	Red Crab	Very high overlap of fishery and habitat, high extent of their range, fishing gear accessing all of habitat with baited traps, no monitoring of stock status, no observer coverage, port sampling or VMS
Medium Risk	Whelk 4Vs	No refuge from fishing gear, no monitoring of stock status at the moment, no observer coverage, some samples being taken by industry but not DFO-led port sampling, no VMS, potential for bycatch of species in surf clam

Risk Category	Fishery	Issues
<i>Medium Risk</i>	<i>Hagfish</i>	Fishing gear reaches all of habitat, capturing juveniles, species aggregates, indicators potentially unreliable due to nature of species, port sampling coverages too small
<i>Low Risk</i>	<i>Bloodworm</i>	-
<i>Low Risk</i>	<i>Whelk 4W</i>	-
<i>Low Risk</i>	<i>Sea Urchin NS</i>	-
<i>Low Risk</i>	<i>Sculpin St. Mary's Bay</i>	-
<i>Low Risk</i>	<i>Softshell Clam</i>	-
<i>Low Risk</i>	<i>Jonah Crab LFA41</i>	-

Table A.4. Detailed scoring matrix for Secondary Species in Maritimes Region.

	High Risk (= 3)	Medium Risk (= 2)	Low Risk (= 1)	Sea Cucumber SWNB	Sea Cucumber 4Vs	Sea Cucumber Midshore	Sea Cucumber Offshore	Jonah Crab LFA38	Jonah Crab LFA34	Jonah Crab LFA41	Sea Urchin LFA38	Sea Urchin LFA36	Sea Urchin NS	Sculpin St. Mary's Bay	Red Crab	Rock Crab	Whelk 4Vs	Whelk 4W	Hagfish	Cunner	Bloodworm	Soft Shell Clam
	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity	Susceptibility + Productivity
1.Overlap of species range with fishery	70 - 100%	30-70%	<30%	3	2	3	3	2	2	0	2	2	1	1	3	1	2	3	2	2	1	1
2.Can fishing gear reach the habitat	High species habitat and depth overlap with fishing gear	Medium species habitat and depth overlap with fishing gear	Low species habitat and depth overlap with fishing gear	2	3	3	3	3	3	0	2	2	1	1	3	2	3	3	3	2	1	1
3.Discard and Post-capture mortality	High discarding and post-capture mortality	Moderate discarding and post-capture mortality	Low discarding and low discard mortality	1	1	1	1	1.5	1.5	1.5	2.5	2.5	1	1	1.5	1.5	1.5	1.5	2	1.5	2	2
4.Are you capturing juveniles?	Size at maturity above size at first capture, or no information	Size at maturity matches size at first capture	Size at maturity well below size at first capture	3	3	3	3	2	2	2	2	2	2	3	2	2	2	2	3	2	2	2
5.Behaviour that makes it vulnerable to fishing	Aggregates or sedentary	Aggregates but not fishing during aggregation	Dispersed	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1

-	High Risk (= 3)	Medium Risk (= 2)	Low Risk (= 1)	Sea Cucumbe r SWNB	Sea Cucumbe r 4Vs	Sea Cucumbe r Midshore	Sea Cucumbe r Offshore	Jonah Crab LFA38	Jonah Crab LFA34	Jonah Crab LFA41	Sea Urchin LFA38	Sea Urchin LFA36	Sea Urchin NS	Sculpin St. Mary's Bay	Red Crab	Rock Crab	Whelk 4Vs	Whelk 4W	Hagfish	Cunner	Bloodwor m	Soft Shell Clam	
pressur e																							
6.Speci es is/was overfished	Critical Zone	Cautious Zone or Healthy Zone, or never assessed	Always in Healthy Zone	3	2	2	2	2	2	3	2	2	3	2	2	2	1	1	1	2	2	2	
Total	-	-	-	2.50	2.33	2.50	2.50	1.92	1.92	1.25	1.92	1.92	1.50	1.50	2.08	1.58	1.75	1.92	2.33	1.75	1.50	1.50	
Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	Management Risk	
1.Validated monitoring of stock status	None	Reliable indicators	High quality fishery independent survey data	3	3	3	3	2	2	2	3	3	3	3	3	3	3	3	2.5	3	3	3	
2.Logbooks - effort	No effort recorded	Some concern about accuracy of effort or spatial location	Spatial location and effort recorded	2	1	1	1	2	2	2	3	3	2	1	1	2	1	1	1	2	2	1	
3.Catch Monitoring	Average of below	Average of below	Average of below	1.5	1.67	1.67	1.67	2.75	2.75	2.75	2.5	2.75	2.75	1.5	2.5	2.8	2.5	2.5	1.33	3	3	3	
3a.Observer Coverage	Little/no coverage	Low amount of coverage (1- 15% per year)	High amount of coverage > 20	3	n/a	n/a	n/a	3	3	3	3	3	3	1	3	3	3	3	n/a	3	3	3	
3b.Port Sampling	0%	5%-19%	19%-100%	1	1	1	1	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	
3c.Doc kside Monitoring	0%	20%-50%	50%-100%	1	1	1	1	2	2	2	1	2	2	1	1	2	2	2	1	3	3	3	
3d.VMS	No		Yes	1	3	3	3	3	3	3	3	3	3	1	3	3	3	3	1	3	3	3	

-	High Risk (= 3)	Medium Risk (= 2)	Low Risk (=1)	Sea Cucumbe r SWNB	Sea Cucumbe r 4Vs	Sea Cucumbe r Midshore	Sea Cucumbe r Offshore	Jonah Crab LFA38	Jonah Crab LFA34	Jonah Crab LFA41	Sea Urchin LFA38	Sea Urchin LFA36	Sea Urchin NS	Sculpin St. Mary's Bay	Red Crab	Rock Crab	Whelk 4Vs	Whelk 4W	Hagfish	Cunner	Bloodwor m	Soft Shell Clam
5.Bycatch of species in other fisheries	high, = or > than directed fishery	20% or less than catch in directed fishery	Little to no bycatch in other fisheries	2	1	1	1	3	3	1	2	2	1	3	1	3	2	1	1	2	1	1
-	-	-	Total	2.13	1.67	1.67	1.67	2.44	2.44	1.94	2.63	2.69	2.19	2.13	1.88	2.69	2.13	1.88	1.46	2.50	2.25	2.00
<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>	<i>Other Risk-Modifier</i>
1.Political Risk	High	Medium	Low	2	2	1	1	1	2	1	1	1	1	2	1	1	2.5	2	2	2	1	1
2.Designated a regional or national priority	Departmental obligations, sectoral priority	Regional importance	Non-critical, program level objectives	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
-	-	-	Total	1.5	1.5	1	1	1	1.5	1	1	1	1	1.5	1	1	1.75	1.5	1.5	1.5	1	1
SP+ M Total	SP+ M Total	SP+ M Total	SP+ M Total	3.28	2.87	3.00	3.00	3.10	3.10	2.31	3.25	3.30	2.65	2.60	2.80	3.12	2.75	2.68	2.75	3.05	2.70	2.50
SPM + Other Total	SPM + Other Total	SPM + Other Total	SPM + Other Total	4.78	4.37	4.00	4.00	4.10	4.60	3.31	4.25	4.30	3.65	4.10	3.80	4.12	4.50	4.18	4.25	4.55	3.70	3.50

Recommendations and possible updates for policies and procedures for the provision of science advice for secondary species: For Review

1. Difficulties identifying priorities.
 - Fix: An updated PSA, with reduced number of variables, will be used to triage species. This analysis will be used as a communication tool for Population Ecology Division (PED) and Resource Management (RM) to communicate priorities nationally and to the industry.
2. It has been difficult for RM and industry to fulfill their roles as described in the 2015 guidelines for secondary species. Additional science resources have been provided in the creation of a Secondary Species unit that can provide information and advice to RM, but better structures are required for facilitating discussions on priorities.
 - Possible fix: Develop structures between RM and Science to facilitate discussions, for example, a management working group that includes Science and RM, or work through species in CSAS advisory processes.
 - Fix: Modify PSA to identify priorities, and discuss this with National headquarters, RM and industry.
3. Some established fisheries have a lower value, owner-operator setup, and a lack of structure for reporting. There is no mechanism to obligate these fisheries to conduct monitoring or analysis. Self-monitoring may conflict with their self-interest, and they may have difficulty in recruiting qualified people. Beyond this, there is also a discrepancy between national and regional policy pertaining to analysis of the data. National policy states that DFO Science will analyze the data while the regional policy puts the onus on industry. There are policy gaps pertaining to privacy concerns with sending data to third parties. DFO cannot share fishing data among licence holders for analyses. The model of industry taking on monitoring has not been successful for secondary species.
 - How do we provide simple and quick advice for species where we will never have some of the information we need, and the risks are never going to be answered? What level of review should each species get and on what time scale?
 - Possible fix: Following completion of the updated PSA, develop a multi-year assessment schedule for secondary species with working group of RM, Science and CSAS.
 - Possible Fix: Secondary Species unit will provide minimum amount of review going forward. Formal requests for science advice will be submitted by RM asking for trends in CPUE, landings, length frequencies, DFO surveys (abundance, biomass, habitat occupancy), risk factors based on life history, biological information (recruitment, size at maturity, age at maturity, life span, mortality, habitat, movement, connectivity, ecosystem indicators). These should identify a blanket risk category for a fishery. Indicators and reference points should be developed with whatever data is available. Monitoring and data gaps can be identified, along with advice for filling those gaps. Once risk factors are described, RM will have enough information to pursue a management strategy commensurate with the risk. Work towards establishing indicators for all of these species that can be used to determine whether the fishery is having an impact on the population.
4. New catch monitoring policy. Address any risks to the fishery if it appears there may be significant risk to non-targeted (bycatch) species. This is easier to assess for new fisheries than established fisheries.
 - Fix: Ensure each fishery is adequately monitoring bycatch, analyse bycatch within CSAS advisory processes to discuss any possible issues.

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5. Determine when CSAS should be engaged in the process.
 - Fix: Any decision point needs to be documented. Decisions not used for fishery management can be documented using the quick response template. CSAS advisory processes should be used for documenting management decisions. For example, Sea Cucumber fishing areas will be established using a CSAS process eventually.
 6. Protocol for response in the absence of a framework.
 - Fix: respond with the information we have and identify the risks.
 7. What is the expectation for science advice on secondary species in terms of updates and frequency?
 - Possible Fix: Propose 3 or 5 year updates rather than annual. Update will be quick.
 - The Secondary Species unit lead will present a multi-year schedule to RM and CSAS for discussion. This will be reviewed by a working group. The schedule will be dependent on other priorities presented to CSAS and the Secondary Species unit and subject to modification.
 8. How do other regions do it?
 9. There are few people outside of DFO qualified for fish stock assessment. Leveraging partnerships is often more work than doing the work within DFO.
 - Possible Fix: Better partnerships with Spatial Statistics unit at Dalhousie University. Discussion of how to prioritize the stocks that need modeling each year should additional stock assessment modelling capacity become available.
 10. Examine a gradient of information in a tier system similar to that used in the US and Australia. Develop general standard approaches and protocols to be utilized in the absence of other information. Undertake an exploration of possible reference points.
 - Possible fix: Put together a small working group to investigate the advantages of a tier system, with examples from what we expect would be in each tier. How would this work, how would we modify it to be appropriate for our use?
 11. How can an ecosystem based assessment approach be incorporated, enabling advice to be provided on an increased number of species? Are there ways to do area-based assessments and spatial-based approaches that could give us added value in small scale fisheries? How do we make practical progress? Currently, the overall risk on a cumulative scale for fisheries has not been considered when new fisheries are approved.
 - Possible fix: Discuss possible approaches with the ecosystem based fisheries management (EBFM) working group. A proposal was submitted to SPERA this year to look at cumulative effects over an area. There was also a proposal to look at incorporating ecosystem variables into stock assessment.
 12. The role of RM should be reviewed. There are opportunities for setting up more precautionary management approaches for species with limited data. The overall objective is to provide practical and consistent decision making and communication to the industry. Possible methods, participation and whether there are national policy limitations preventing a regional approach need to be considered. How will fisheries with no information be managed. For example, the Jonah Crab fishery has a complicated management situation because of bycatch in the lobster fishery. How much risk is appropriate if there is a single reliable indicator of stock status, or an absence of data?
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- Possible fix: establish a working-group with participation by managers from RM, Science and the Secondary Species unit.

13. What are the minimum requirements to move a new exploratory fishery to commercial?

- Fix: The science advisory process underway for Whelk is an opportunity for Science to work with RM in developing a precedent for moving a fishery from exploratory to commercial status. Important components are the minimum monitoring requirements for a fishery, and establishing confidence that exploitation levels are sustainable and that indicators of stock status are reliable. Establishing risk based on the risk framework could be considered for these exploratory species. Alternatively, a threshold of risk could be established for moving a fishery to commercial when there is sufficient information.

14. Templates for the fishing industry

- Fix: This could be identified as a priority going forward in work planning for Science and RM. Another catch monitoring proposal could be submitted next year.

15. Is there scope for DFO Science to undertake additional basic monitoring?

- Fix: Currently there are no additional resources for monitoring within Science. The Scallop and Secondary Species units have submitted a proposal to work on survey and indicator development for some of the secondary species. The offshore Sea Cucumber fishing industry is trialling video surveys. The fishing industry for Whelk may also be implementing monitoring. Species with weak or no monitoring are Hagfish, and the inshore fisheries for Bloodworm and clams.

16. Create a revised protocol for Secondary Species

- Fix: The Secondary Species unit will review the protocol against these recommendations and propose where updates need to be made. These will be presented to the smaller working group and then the entire group.

17. Should enterprise fisheries be considered to have more capacity to do their own monitoring and analysis compared to owner-operator?

- Possible Fix: Consider updating the protocol so that relatively more resources are spent on owner-operator while more effort is expected by the enterprise licences.

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