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Proceedings of the regional peer meeting on the Assessment of the Newfoundland West Coast (4R) Herring Stocks in 2015

**March 8, 2016
Mont-Joli, Quebec**

**Chair: Yvan Lambert
Reporter: Sonia Dubé**

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Foreword

The purpose of these proceedings is to document the key activities and discussions of the meeting. The Proceedings may include research recommendations, uncertainties and the rationale for decisions made during the meeting. The Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. Therefore, interpretations and opinions presented in this report 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 within the time frame of the meeting. In the rare case when there are formal dissenting views, these are also archived as Appendices to the Proceedings.

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SUMMARY

This document contains the proceeding from the meeting held within the regional assessment of the West Coast of Newfoundland (4R) herring stocks. This review process was held on March 8th, 2016 at the Maurice Lamontagne Institute in Mont-Joli. This meeting gathered about twenty participants from sciences to management. This proceeding contains the essential parts of the presentations and discussions held and relates the recommendations and conclusions that were presented during the review.

SOMMAIRE

Ce document renferme le compte rendu de la réunion régional par des pairs sur l'évaluation du hareng de la côte ouest de Terre-Neuve (4R). Cette revue, qui s'est déroulée le 8 mars 2016 à l'Institut Maurice-Lamontagne à Mont-Joli, a réuni près d'une vingtaine de participants des sciences et de la gestion. Ce compte rendu contient l'essentiel des présentations et des discussions qui ont eu lieu pendant la réunion et fait état des recommandations et conclusions émises au moment de la revue.

INTRODUCTION

The Quebec Region of the Department of Fisheries and Oceans (DFO) is responsible for assessing the stocks of several exploited fish and invertebrate species in the Estuary and Gulf of St. Lawrence. Most of these stocks are assessed periodically within a regional advisory process, which is conducted at the Maurice Lamontagne Institute in Mont-Joli. This document consists of the proceedings of the March 8, 2016 meeting on the assessment of herring stocks along the west coast of Newfoundland.

The objective of the review was to determine whether there were any changes in the resource's status and whether the management plans required any adjustments based on the chosen conservation approach, the ultimate goal being to provide scientific advice on managing the herring stock along the west coast of Newfoundland (4R) for the 2016 and 2017 fishing seasons.

These proceedings report on the main points discussed in the presentations and deliberations stemming from the activities of the regional stock assessment committee. The regional review is a process open to all participants who are able to provide a critical outlook on the status of the assessed resources. Accordingly, participants from outside DFO are invited to take part in the committee's activities within the defined framework for this review (Appendices 1 and 2). The proceedings also list the recommendations made by the meeting participants.

BACKGROUND

Meeting chair Yvan Lambert welcomes the participants. He goes over the peer review objectives and agenda. After the participants introduce themselves, stock assessment biologist Thomas Doniol-Valcroze begins the meeting by highlighting the contribution of his collaborators. He presents the agenda and the framework for the review. He reviews a few aspects of herring biology and the 4R stock, which includes two groups of spawners: spring (April-May) and fall (August-September) spawners. A short description of the fishery and a brief summary of the last Science Advisory Report are provided. He recalled that the analytical model was not retained during the last assessment because too few acoustic surveys had been performed since this time series resumed in 2009.

ASSESSMENT OF THE RESOURCE

LANDINGS

The biologist presents landing statistics by unit area, fishing gear, landing date and landings maps. Based on preliminary data for 2015, 19 436 tonnes of herring from the west coast of Newfoundland (4R) were landed against a 20,000-tonne total allowable catch (TAC). Large and small seiners caught their full quotas, while fixed gear vessels caught 82% of theirs.

- A participant said that spring fishing activities were severely reduced in the 1990s to protect spring spawning herring.
- Some participants were concerned about bait fishing. As indicated in the 2014 Science Advisory Report, the lack of gillnet bait fishery statistics is one of the main sources of uncertainty in the 4R herring fishery. This bait fishery is conducted during the lobster fishery season and therefore targets spring-spawning herring, whose abundance is still very low. It appears that an approach to calculating these bait catches had been proposed by the

industry. However, many participants (scientists and managers) agree that the bait fishery is minor compared to the commercial fishery.

BIOLOGICAL DATA

Catches-at-age and the key biological indicators are presented for both stocks. Fall herring spawner catches are currently dominated by individuals aged 11 and over. Age 7 herring appear to be relatively more abundant in recent years. Due to the low number of spring spawners in 2015 biological samples, an accurate catch-at-age figure could not be calculated for this stock. The few spring spawners in the samples were mainly aged 2 and 3 years.

- The fishery can be supported for a fairly long time by older year-classes (as we have seen on several occasions in the past).
- It is suggested that effort be increased to boost the number of spring spawners in samples, by targeting larger individuals. The few fishes sampled are juveniles that may no longer be spawners in the spring.
- In connection with the condition index presented, some participants said that a fat index measurement could be a better indicator.

MULTIDISCIPLINARY SURVEY CATCHES

The biologist provides a brief presentation of the information on herring catches in multidisciplinary surveys, including a dispersion index from the Teleost survey and distribution maps of herring catches in the July mobile gear sentinel surveys.

- A participant notes that the dispersion index should be used with caution, given the variety of potential interpretations. Participants suggest that this index not be used.

2015 ACOUSTIC SURVEY

An acoustic survey was conducted in October 2015. Due to logistical constraints some strata had to be prioritized, and the intensity of spatial coverage had to be reduced. Despite these constraints, the confidence interval of the biomass estimate was among the best in the time series. In 2015, few samples were collected during the acoustic survey because the fishery was primarily conducted in November and December. Consequently, the stock biomass index and age structure are sensitive to the choice of samples used for the calculations. According to the acoustic survey, the estimated total biomass for spring spawners in 2015 was 1,200 t and 97,000 t for fall spawners, and the total biomass index for fall spawners from the acoustic survey has remained between 85,000 t and 122,000 t since 2009.

- Since the stock biomass index and age structure are sensitive to the choice of samples used for the calculations, the main discussion focused on sample selection. Should we consider only the four fishery samples taken during the acoustic survey or all fishery samples?
- After some discussion, participants agree that spatial variations are more important than temporal variations, and that all samples should be considered, which is the last scenario presented in the analytical model (option: low; 1991-2002 and 2009-2015 surveys). This scenario seems to best represent the situation. We will be able to quantify the uncertainty. A participant then suggests that a random sample be taken for the central area of 4R and that we use samples from the northern and southern areas weighted by biomass.

ANALYTICAL MODEL – SEQUENTIAL POPULATION ANALYSIS

A sequential population analysis (SPA) model using commercial fishery data was calibrated with acoustic abundance indices. The SPA and the 2015 acoustic index confirm the collapse of the spring spawning stock and indicate that current spawning biomass is below the limit reference point for this stock. The SPA for the fall stock exhibits significant retrospective patterns, but is consistent with the acoustic indices indicating a sharp increase in spawning biomass from 2003 to 2010, followed by a steady decrease until 2015.

- While there may be some doubt as to whether the SPA is a useful tool for assessing the status of spring spawning stock, participants agree that the SPA is still useful. It confirms the type of decline and the results of the last two surveys. Statistically, it is still valid.
- With respect to fall spawners, participants are concerned about the significant increase in 2009 and 2010. It seems that the model created recruits in 2002 that are not in the fishery. Incorrect age attribution may have produced a “year” effect. However, a participant says that the SPA and the acoustic survey produced similar values.
- The meeting expresses confidence in the SPA’s trajectory. However, there is still uncertainty about the absolute level of fall spawners’ biomass. The 2015 value appears plausible, despite the retrospective pattern.
- Finally, a participant says projections will be made from the SPA, but will not be included in the 2016 Science Advisory Report.

ECOSYSTEM CONSIDERATIONS

Stéphane Plourde reviews the results produced by an environmental model. The purpose of this model was to describe the effect of environmental variations (physical and biological) on various herring stock dynamic indicators in 4R, including the spawning stock biomass (SSB). This study also allowed us to make recruitment and spring- and fall-spawning biomass projections for the 2004 to 2012 period for which no satisfactory SPA exists.

The variations in the condition index, weight at age (1990-2012) and recruitment (1990-2002) of spring and fall stocks are primarily associated with fluctuations in zooplankton dynamics and physical conditions. The analysis does not reveal that spawning biomass has a significant impact on recruitment. The spring-spawning stock biomass varies depending on fishing mortality, recruitment (environmental effect) and the predation mortality index, whereas the fall stock fluctuates according to recruitment and the predation mortality index. Based on the predictions, the two stocks have declined in the last 10 years.

- These results therefore suggest that changes in environmental conditions may have affected the productivity of both the 4R herring stocks and, even more so, the spring stock.
- To better understand what is happening, it is recommended that the various productivity regimes be considered, and that the environment be taken into account in future assessment models.

CONCLUSION

FUTURE RESEARCH WORK

The purpose of the work deemed a priority by the meeting is to:

- Improve sampling during the acoustic survey;

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- Develop a more flexible catch-at-age statistical model;
 - Review the reference points;
 - Include the productivity regime (environment) in the model and the reference points (Strategic Program for Ecosystem-Based Research and Advice (SPERA) project);
 - Examine the effect of environmental changes on spring herring;
 - Review the otoliths to reassign year-classes.

INTERIM YEARS

The participants intend to provide an advice for the next two fishing seasons (2016 and 2017). No indices will be reviewed in the meantime, because no new surveys are scheduled in 4R before fall 2017.

HIGHLIGHTS AND RECOMMENDATION

The highlights are presented and the participants comment on them. Some facts are withdrawn, others are simplified. Comments having to do with stylistic rewording are not reported.

- With respect to the highlights of the SPA results, given the uncertainty regarding the absolute values of spawning biomass, only general trends will be discussed. This uncertainty should be mentioned. However, we also bear in mind that the SPA and the 2015 acoustic index produced similar results.
- Participants believe the 4R herring status is likely to deteriorate, partly because of the aging fish population and the apparent lack of significant recruitment.
- According to participants, spawning biomass will probably continue to decline with the current level of catches.

Finally, some **recommendations** are made:

Fall spawners:

Given the retrospective pattern of the SPA, there is uncertainty regarding the absolute level of the fall spawners' biomass. However, the SPA and the 2015 acoustics index both suggest that the current spawning biomass is above the upper reference point. If the older fish that supported the fishery in recent years continue to decline and there is no significant recruitment, maintaining the current catch level may cause the stock to fall below the upper reference level within the next two years.

Spring spawners:

Given the ever-decreasing spring-spawning stock, it is recommended that management measures introduced in the late 1990s to protect the stock's ability to reproduce be maintained.

APPENDICE 1- LISTE DES PARTICIPANTS

Name	Affiliation
Bernier, Denis	MPO Sciences / DFO Sciences
Castonguay, Martin	MPO Sciences / DFO Sciences
Couillard, Catherine	MPO Sciences / DFO Sciences
Cyr, Charley	MPO Sciences / DFO Sciences
Desgagnés, Mathieu	MPO Sciences / DFO Sciences
Doniol-Valcroze, Thomas	MPO Sciences / DFO Sciences
Dubé, Sonia	MPO Sciences / DFO Sciences
Émond, Kim	MPO Sciences / DFO Sciences
Gauthier, Johanne	MPO Sciences / DFO Sciences
Girard, Linda	MPO Sciences / DFO Sciences
Godin, Aurélie	WWF - Canada
Hurtubise, Sylvain	MPO Sciences / DFO Sciences
Lambert, Yvan	MPO Sciences / DFO Sciences
Légaré, Benoît	MPO Sciences / DFO Sciences
McQuinn, Ian	MPO Sciences / DFO Sciences
Plourde, Stéphane	MPO Sciences / DFO Sciences
Simm, Jason (tél)	MPO GPA / DFO FAM
Von Beveren, Elisabeth	MPO Sciences / DFO Sciences

APPENDICE 2 – TERMS OF REFERENCE

Assessment of the 4R herring stocks in 2015

Regional Peer Review - Quebec Region

March 8, 2016

Mont-Joli, QC

Chairperson: Yvan Lambert

Context

The west coast of Newfoundland herring fishery is managed by a Total Allowable Catch (TAC) associated with both spawning stocks. The current TAC of 20,000 t was set during the last analytical assessments. The TAC split between the various fleets is as follows: 55% for large seiners (> 65'), 22% for small seiners (<65') and 23% for fixed gear.

A first series of acoustic surveys was conducted between 1991 and 2002 with the objective to evaluate the abundance of the two spawning stocks. A second series of surveys was initiated in the fall of 2009 following the recommendations from the Fisheries Resource Conservation Council (FRCC). When this series will be long enough, it will allow the use of an analytical assessment and the update of biological reference points that were established from the results of the first series of surveys. They will help develop a strategic framework for fisheries consistent with the precautionary approach. This framework aims to reduce the risk of serious or irreversible damage to commercially exploited stocks.

The last assessment of the two herring spawning stocks in 4R dates back to 2014. The Fisheries and Aquaculture Management Branch has requested a scientific advice on these stocks for the 2016 and 2017 fishing seasons. The objective of the review is to determine whether changes that have occurred in the stock status necessitate adjustments to management plans based on the conservation approach used.

Objectives

Provide a scientific advice of the spring and fall spawning herring stocks in NAFO Division 4R (Newfoundland's West coast) for the 2016 and 2017 fishing seasons. This advice shall include:

- An evaluation of the status of the herring stocks in 4R, based on:
 - commercial fishery statistics following the 2014 and 2015 seasons (overall distribution of landings, breakdown by unit area, month and fishing gear, etc...);
 - an update of the main biological indicators (age structure, maturity, condition, etc...);
 - sentinel catches and index of dispersion calculated from the Teleost catches;
 - results of the 2015 fall acoustic survey.
- Presentation of the results of an analytical assessment if the data allow it.
- Ecosystem and environmental considerations.
- The identification and prioritization of research projects to be considered for the future.
- Identification of indicators to follow the stocks status during the years without a formal stock assessment.
- Perspectives for 2016 and 2017 based on available data.

Expected Publications

- 1 Science Advisory Report
- 1 Proceedings
- 2 Research Documents

Participation

- Fisheries and Oceans Canada (DFO) Science and Fisheries Management
- Newfoundland and Labrador Provincial representatives
- Fishing industry