



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Ecosystems and
Oceans Science

Sciences des écosystèmes
et des océans

Canadian Science Advisory Secretariat (CSAS)

Proceedings Series 2018/020

Quebec and Newfoundland and Labrador Regions

Proceedings of the Zonal Peer Review Meeting of the Assessment of Redfish Stocks (*Sebastes mentella* and *S. fasciatus*) in Units 1 and 2

**March 14-15, 2018
Mont-Joli, Quebec**

**Chairperson: Martin Castonguay
Rapporteur: Sonia Dubé**

Maurice Lamontagne Institute
Fisheries and Oceans Canada
850 Route de la Mer, P.O. Box 1000
Mont-Joli, Quebec G5H 3Z4

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.

Published by:

Fisheries and Oceans Canada
Canadian Science Advisory Secretariat
200 Kent Street
Ottawa ON K1A 0E6

<http://www.dfo-mpo.gc.ca/csas-sccs/>
csas-sccs@dfo-mpo.gc.ca



© Her Majesty the Queen in Right of Canada, 2019
ISSN 1701-1280

Correct citation for this publication:

DFO. 2019. Proceedings of the zonal peer review meeting of the Assessment of Redfish Stocks (*Sebastes mentella* and *S. fasciatus*) in Units 1 and 2; March 14-15, 2018. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2018/020.

Aussi disponible en français :

MPO. 2019. *Compte rendu de l'examen zonal par des pairs sur l'évaluation des stocks de sébaste (Sebastes fasciatus et S. mentella) des unités 1 et 2; du 14 au 15 mars 2018. Secr. can. de consult. sci. du MPO, Compte rendu 2018/020.*

SUMMARY

This document contains the proceedings from the meeting held within the zonal assessment process on redfish in Units 1 and 2. This review process was held on March 14-15th, 2018 at the Maurice Lamontagne Institute in Mont-Joli. This meeting gathered about sixty participants from science, management and industry. These Proceedings contain the essential parts of the presentations and discussions held, and report the recommendations and conclusions that were presented during the review.

INTRODUCTION

The Quebec and Newfoundland and Labrador Regions of Fisheries and Oceans Canada (DFO) are responsible for assessing several stocks of fish and invertebrate species harvested in the Estuary and Gulf of St. Lawrence. Most of these stocks are periodically assessed as part of a regional or zonal advisory process. This document consists of the proceedings of the zonal meeting held on March 14-15, 2018, on the assessment of the Units 1+2 redfish stocks held at the Maurice Lamontagne Institute in Mont-Joli, QC.

The objective of the review was to determine whether there are any changes in resource status and whether management plans need to be adjusted based on the chosen conservation approach, the ultimate goal being to formulate a Science Advisory Report on the assessment of Units 1+2 redfish stocks.

These Proceedings report on the main points of the presentations and deliberations during the zonal stock assessment (Appendices 1 and 2 detail the meeting participants and Terms of Reference for the review). The Proceedings also list the recommendations made by meeting participants.

CONTEXT

The meeting chairperson, Martin Castonguay, summarized the peer review objectives and process. The biologist in charge of the review, Caroline Senay, highlighted various collaborators' contributions and presented the Terms of Reference.

A few components of redfish biology were presented: distribution, criteria for distinguishing the species, habitat, growth and reproduction. Both species of redfish are distributed according to depth. *Sebastes fasciatus* dominates at depths less than 250 m, along the slopes of channels and on banks. *Sebastes mentella* mainly predominates in the main channels, at depths greater than 250 m. Geneviève Parent briefly presented the preliminary results of recent work on the genetic structure of populations. In addition to the two known ecotypes for *S. mentella* (shelf, slope), this work has uncovered a new ecotype for the Gulf. For *S. fasciatus*, 6 groups have been identified: they are less differentiated and less dispersed than *S. mentella*. Peter Galbraith briefly overviewed the oceanographic conditions. A warming of the deep waters of the Gulf of St. Lawrence was observed to be above 7°C. This warming is expected to continue in the coming years.

- It was specified that the incoming large cohort of *S. mentella* in the Gulf are part of the Gulf ecotype; therefore, it have been generated by parents from the Gulf.
- In addition, for *S. mentella*, a specific signature is observed that includes a heritage of introgressive hybridization passed down from generation to generation. These hybrid individuals are considered *S. mentella*.
- It is noted that recruitment is currently observed to be greater than the recruitment that contributed to the fishery in the past. The new cohorts (2011 to 2013) are indeed very abundant.
- Meeting participants were reminded that the minimum commercial size of 22 cm, which is less than the sexual maturity size of 25 cm, was implemented in the early 1990s to harmonize this measurement with Unit 3O. An update is planned.
- Regarding oceanic conditions, we are seeing the same types of positive anomalies (warm events) as in the 1980s; this may explain the increase in recruitment. The ecosystem is

currently dominated by the return of groundfish, particularly of redfish, and a decrease of invertebrates, including shrimp.

RESOURCE ASSESSMENT

DESCRIPTION OF THE FISHERY

Caroline Senay (Unit 1) and Bob Rogers (Unit 2) describe the fishery. For the 2017-2018 management year (February 26, 2018 preliminary data), redfish landings reached 192 t in Unit 1 for a 2,000 t index fishery. In Unit 2, 2,077 t of redfish was landed out of a total allowable catch (TAC) of 8,500 t. Landings were lower than the average annual landings of 2010 to 2016: 499 t and 3,592 t in Units 1 and 2, respectively. Key stakeholders are of the opinion that management measures, market conditions, the small size of redfish and the moratorium's impact have limited the recent years' fishing effort in Unit 1. In Unit 2, market conditions were the main factor limiting the fishing effort.

From 2010 to 2017, landed bycatch in the directed redfish fishery using mobile bottom gear represented 9% of redfish landings in Unit 1 and 4% in Unit 2. The most common bycatch included, in Unit 1, Greenland Halibut, White Hake and Atlantic Cod, and in Unit 2, Atlantic Cod and Witch Flounder.

- Participants were reminded that there has been a moratorium in Unit 1 since 1995 and a bottom trawl index fishery since 1998. Participants asked about the origin of landings observed in the 1980s (boat size, gear, areas).
- Fishery representatives would like to have an overview of Catch Per Unit Effort (CPUE) by gear, month and area.
- Industry representatives asked about the duration of Unit 1 area closures to protect coral and sponges. The advisory committee will handle this question.
- The expected bycatch increase linked to the increased effort in the directed redfish fishery is part of current concerns. Nonetheless, it was decided that the research document should exclude the presented projections.
- As for the initial reflective exercise on how to mitigate bycatch, particularly in relation to the depth profiles of main species bycatch, participants are reminded to avoid generalizing. This exercise is only useful to generate discussion.
- Industry representatives felt that a larger fishery in Unit 1 would provide more data and a better picture of the situation.
- Participants were reminded that a Fisheries Science Collaborative Program (FSCP) project is currently conducting an in-depth examination of gear selectivity (trawl nets and midwater trawls).

SCIENTIFIC SURVEYS: DFO – UNIT 1; GEAC – UNIT 2

The scientific survey indices were provided for both units and both species. The abundance of juvenile redfish from the 2011 to 2013 cohorts has increased massively as shown in research surveys by DFO (Unit 1) and Groundfish Enterprise Allocation Council (GEAC) (Unit 2). These are the most abundant cohorts to have been observed in research surveys. These individuals are largely dominated by *S. mentella* and carry the genetic signature of the adult population of Units 1 and 2. In summer 2017, the 2011 to 2013 redfish cohort had a modal size of 20 cm. If the growth expected for these cohorts continues, nearly 50% of individuals (59% of the

biomass) in the 2011 cohort should be over 22 cm, the minimum harvest size, by 2018. In 2020, 51% of individuals in the cohort (62% of the biomass) should be longer than 25 cm.

Based on the 2017 Unit 1 research survey, the total minimum trawlable biomass was estimated at 2,166,000 t for *S. mentella*, the highest value observed since 1984. The total biomass of *S. fasciatus*, estimated at 346,000 t, is of the same order of magnitude as the highest value since 1984. In Unit 1, the minimum trawlable biomass of redfish longer than 22 cm began increasing in 2017. It was estimated at 349,000 t for *S. mentella* and 89,000 t for *S. fasciatus*. However, the survey reveals that the biomass of redfish longer than 25 cm has not yet begun increasing. By 2019, the biomass of redfish longer than 25 cm should strongly increase.

In Unit 2, the total minimum trawlable biomass of redfish longer than 22 cm has been stable since 2005. In 2016, it was estimated at 86,000 t for *S. mentella* and 167,000 t for *S. fasciatus*. The biomass of redfish longer than 25 cm has remained stable, but should strongly increase by 2019.

- There is high confidence in the method for distinguishing between species. A comparison with microsatellite markers confirmed the validity of this method.
- It was also mentioned that the method of identifying mature and immature individuals based on maturity ogives directly impacts our perception of the stock.
- It was noted that a model to convert data from the GEAC survey into *Teleost* equivalents gives standardized and comparable data between Unit 1 and Unit 2.
- The abundance indices for the multispecies survey of the southern Gulf were presented. It was worth noting the correlation with the index of the northern Gulf DFO survey. It was suggested to calibrate these surveys in order to cover the entire Gulf. According to the results of the August bottom trawl research survey in Unit 1, the distribution of both redfish species is depth-based. In addition, as they grow, large redfish seems to concentrate in the deeper areas of the Laurentian Channel. Currently, high recruitment of new cohorts causes the biomass of individuals smaller than 22 cm to dominate at all depths.

In summer, the diet of Unit 1 redfish varies according to fish size. Redfish less than 20 cm long consume mainly zooplankton and redfish 20 cm long consumes mainly shrimp (Northern Shrimp and White Shrimp). When redfish reaches 25 cm, they begin consuming fish. The massive increase in redfish significantly impacts the ecosystem. Increasing predation notably decreases the abundance of Northern Shrimp in the Estuary and Gulf of St. Lawrence.

- Participants asked about the diet of large redfish in future years considering decreased Northern Shrimp abundance.
- It was suggested to compare the size-depth relationship in the *Teleost* survey with the *Gadus* winter survey.
- Regarding the species-depth relationship, participants asked about the impact of deep water warming. They were reminded of the need to also consider the impact of density dependence, even though there is as yet no indication that it occurs.

PRECAUTIONARY APPROACH

Daniel Duplisea briefly described the Management Strategy Evaluation (MSE) work on going aiming to determine the management procedures, reference points and TACs for Units 1 and 2 redfish. Led by fisheries managers and supported by scientists, this process involves various stakeholders: the fishing industry, First Nations, NGOs and provinces. Begun in January 2017, it

will be peer-reviewed in April 2018. The approach is based on an adjusted population model and involves several simulations that test various management rules.

- The participants asked about the approach's implementation. Will it apply to the next fishing season, in addition to the empirical approach? The advisory committee will decide on this issue in May.
- Several participants asserted that both approaches are complementary and can contribute to the assessment of redfish stocks of Units 1 and 2.

CONCLUSION

ONGOING PROJECTS – UNIT 1

- FSCP trawl selectivity.
- FSCP reproduction, Units 1-2: site, time, depth and maturity ogive.
- DFO-RAQ (Ressources Aquatiques Québec), return of groundfish: spatiotemporal distribution, new genetic (Single Nucleotide Polymorphisms) data, diet monitoring, trophic relationships, factors contributing to a groundfish increase, socioeconomic impact of reopening the fishery.

ONGOING PROJECTS – UNIT 2

- Exploring whether the data from the spring (NL) multispecies surveys can be applied as an index for Unit 2 redfish, in addition to the GEAC survey.
- Jointly studying Unit 1 redfish reproduction with DFO-Quebec.
- Potentially extending the survey to the Maritimes.

LACKING INFORMATION

- Proportion of species in the commercial fishery.
- Impact of the environment and density dependence on productivity parameters: maturity, L_{inf} , growth rate and mortality.
- Ecosystem consequences on other stocks, feedback on redfish.
- Impact of evolving bottom temperatures, changes in phytoplankton blooms and changes in the community structure of fish in 3Ps.

INTERIM YEAR AND NEXT ASSESSMENT YEAR

The next assessment is scheduled for winter 2019 or winter 2020. DFO and GEAC survey indicators (CPUE, length frequency, catch distribution) will be updated in fall 2018.

- Participants suggested aligning the stock assessment survey with the GEAC survey (fall 2018), and therefore holding the next peer-review in 2019 and every two years thereafter.
- Several redfish meetings are planned and will follow up on the status of these stocks and progress.

SUMMARY AND RECOMMENDATIONS

Key points are presented below:

-
- In the bullet on landings, it is worth noting that Unit 1 involves an index fishery (2,000 t). It is important to present the landings corresponding to the management year in order to compare them to the TACs.
 - The bullet on the fishing effort and CPUE will cover only the effort. The advice in the body of the report will include the CPUE. There is agreement for both Management Units on the main factors that limited this effort: for Unit 1, management measures, market conditions, the small size of fish and the moratorium's impact; for Unit 2, management measures.
 - It should be noted that bycatch is linked only to mobile bottom gear.
 - The bullet on the 2011 to 2013 cohort should be restructured as to not link the genetic studies to GEAC. It must be made clear that it is the abundance of these cohorts that is increasing.
 - Regarding the modal-size highlight, it is preferable to omit size at sexual maturity given the uncertainty about the maturity ogive. Prudence is required when forecasting since some productivity parameters may change.
 - Given the uncertainty about size at maturity, the biomass bullet will focus on the minimum trawlable biomass > 22 cm and > 25 cm. It will emphasize the high values.
 - The bullet on the size-depth relationship should specify that this data is drawn from the August bottom trawl research survey.
 - The size-diet relationship point specifies that redfish consume shrimp when they reach 20 cm, and then fish when they reach 25 cm.
 - Regarding the impact on the ecosystem, it was suggested to omit the competition issue. Without making value judgments, it should be mentioned that predation by redfish is progressively contributing to diminishing Northern Shrimp abundance.
 - It was agreed to remove the bullet on trawl selectivity but to discuss it in the advice.
 - The recommendation should differentiate between Unit 1 and Unit 2 as well as between both species. Following discussion, the participants agreed on how to formulate the recommendation.
 - The participants highlighted the need to align both Units' management measures.

The participants formulated the recommendation as follows:

Prospects are very positive for redfish stocks in Units 1 and 2. Although high recruitment and increased biomass may allow for higher catches of *S. mentella* in Unit 1 as of 2018, prudence is preferable for *S. fasciatus*.

APPENDIX 1- LIST OF PARTICIPANTS

| Name | Affiliation |
|---------------------------------|---|
| Archibald, Devan | Oceana Canada |
| Belley, Rénaud | DFO – Science - Quebec |
| Benoît, Hugues | DFO – Science - Quebec |
| Bernier, Denis | DFO – Science - Quebec |
| Boucher, Jean-René | RPPNG |
| Boudreau, Paul (tel) | Madelipêche |
| Bourassa, Marie-Michèle | DFO – Species at Risk Management - Quebec |
| Bourdages, Hugo | DFO – Science - Quebec |
| Bourdages, Yan | ACPG |
| Brassard, Claude | DFO – Science - Quebec |
| Brown-Vuillemin, Sarah | ISMER/UQAR |
| Burns, Corinne | ISMER/UQAR |
| Castonguay, Martin | DFO – Science - Quebec |
| Cerqueira, Andy | MAPAQ |
| Cervello, Gauthier | ISMER/UQAR |
| Chabot, Denis | DFO – Science - Quebec |
| Chamberland, Jean-Martin | DFO – Science - Quebec |
| Chevarie, Lise (tel) | Merinov |
| Chevarie, Pascale (tel) | Merinov |
| Chiasson, Hector | ACAG/FRAPP |
| Chouinard, Pierre-Marc S. | DFO – Science - Quebec |
| Coffin, David | DFO – Fisheries Management – NL |
| Côté-Laurin, Marie-Claude (tel) | Merinov |
| Cotton, Dan | ACPG |
| Courchesne, Sandra | DFO – Fisheries management - Ottawa |
| Coussau, Lola | ISMER/UQAR |
| Cyr, Charley | DFO – Science - Quebec |
| Delanay, Paul (tel) | Madelipêche |
| Denis, Marcel | ACPG |
| Desgagnés, Mathieu | DFO – Science - Quebec |
| Dubé, Sonia | DFO – Science - Quebec |
| Duplisea, Daniel | DFO – Science - Quebec |
| Dwyer, Shelley | Government of NL |
| Galbraith, Peter | DFO – Science - Quebec |
| Gauthier, Johanne | DFO – Science - Quebec |
| Gilbert, Michel | DFO – Science - Quebec |
| Grelon, Damien | Merinov |
| Hurtubise, Sylvain | DFO – Science - Quebec |
| Karbowski, Chelsey | Ecology Action Center |
| Langelier, Serge | AMIK |
| Lamare, Joan | ISMER/UQAR |
| Lambert, Catherine | AGHAMM |
| Lambert, Yvan | DFO – Science - Quebec |
| Lavoie, Cécile | DFO – Fisheries management - Golfe |
| Lubar, John | DFO – Fisheries management - NL |
| Marentette, Julie | DFO – Science - Ottawa |
| Marquis, Marie-Claude | DFO – Science - Quebec |
| Martinez, Maria | ISMER/UQAR |
| Morin, Bernard | DFO – Fisheries management - Quebec |
| Morneau, Renée | DFO – Science - Quebec |
| Myles, Geneviève | ACPG |
| Ouellette-Plante, Jordan | DFO – Science - Quebec |
| Plourde, Stéphane | DFO – Science - Quebec |

| Name | Affiliation |
|------------------------|------------------------|
| Parent, Éric | DFO – Science - Quebec |
| Poirier, Mélanie | DFO – Science - Quebec |
| Robert, Dominique | ISMER/UQAR |
| Rogers, Bob | DFO – Science - NL |
| Roussel, Eda | ACAG/FRAPP |
| Roux, Marie-Julie | DFO – Science - Quebec |
| Senay, Caroline | DFO – Science - Quebec |
| Smith, Andrew | DFO – Science - Quebec |
| Van Beveren, Elisabeth | DFO – Science - Quebec |
| Vascotto, Kris | GEAC |
| Yihao, Yin | DFO – Science - Quebec |

APPENDIX 2- TERMS OF REFERENCE

Assessment of Redfish Stocks (*Sebastes mentella* and *S. fasciatus*) in Units 1 and 2

Zonal Peer Review - Quebec and Newfoundland & Labrador Regions

March 14-15, 2018

Mont-Joli, Qc

Chairperson: Martin Castonguay

Context

Redfish in Units 1 and 2 (*Sebastes mentella* and *S. fasciatus*) are part of a single stock and are distributed in the Gulf of St. Lawrence, as well as in the Laurentian Channel and Laurentian Fan Regions south of Newfoundland and northeast of Nova Scotia. Since the 1950s, three episodes of intense exploitation have followed the recruitment of one or a few strong cohorts. The lack of substantial recruitment and a significant decrease in stock biomass led to the establishment of a moratorium in 1995 in Unit 1. An index fishery has been authorized since 1998 and the total allowable catch is 2,000 tonnes (t) per year since 2006. In the 1990s, total allowable catches in Unit 2 have declined significantly and since 2006 have been at 8,500 t per year. In both units, total allowable catches have not been completely caught in recent years. From 2011 to 2013, the recruitment of three large cohorts was observed and genetic analyzes demonstrated that it consisted mainly of *S. Mentella* belonging to the Gulf of St. Lawrence stock. In recent years, the abundance and biomass of the stock has risen above the historical average and outside the critical zone. In the last assessment, it was anticipated that close to 50% of the 2011 cohort would reach commercial size (22 cm) in 2018 and size of sexual maturity (25 cm) in 2020 (Brassard et al. 2016), and redfish seem to be following their anticipated growth curve. The imminent approach to recruitment of these fish into the commercial fishery therefore requires a review of available data to facilitate decision-making by fisheries management.

Objectives

Provide scientific advice on the status of Units 1 and 2 redfish stocks. Whenever possible, assess separately the status of *Sebastes mentella* and *S. fasciatus* in Units 1 and 2. This advice will include:

- A description of the biology and distribution of redfish in Units 1 and 2;
- A summary of oceanographic and ecosystem conditions;
- A description of the redfish fishery including landings, fishing effort, catch per unit effort, biological data, and bycatch of other species in the redfish fishery;
- An update of abundance and biomass indices from industry and DFO surveys (including size structure and geographic distribution of catches);
- The expectations for the impact of the 2011 to 2013 cohorts on stock status when these cohorts recruit to the fishery;
- The identification of basic elements to consider for the next assessment;
- The timing of the next evaluation year;
- The identification and prioritization of the elements to be improved and research work to be considered for the future; and
- An advice for the 2018 and 2019 fishing seasons based on available data. The scientific advice should consider both redfish species and the two management units (Units 1 and 2).

Expected Publications

-
- Science Advisory Report
 - Proceedings
 - Research Document

Participation

- Fisheries and Oceans Canada (DFO) (Science and Ecosystems and Fisheries Management sectors)
- Aboriginal Communities/Organizations
- Provincial Representatives
- Fishing Industry
- Academics and Other External Experts

References

Brassard, C., Bourdages, H., Duplisea, D., Gauthier, J., and Valentin, A. 2017. The status of the redfish stocks (*Sebastes fasciatus* and *S. mentella*) in Unit 1 (Gulf of St. Lawrence) in 2015. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/023. ix + 53 p.