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Proceedings of the Zonal Advisory Meeting on the Assessment of Redfish Stocks (*Sebastes mentella* and *S. fasciatus*) in Units 1 and 2 in 2021

February 21-24 and March 16, 2022
Virtual meeting

Chairpersons: Marie-Julie Roux and Keith Lewis
Editor: Sonia Dubé

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

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Canada

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

This document contains the proceedings of the meeting held as part of the zonal stock assessment process for redfish stocks in Units 1 and 2. The review, which took place from February 21 to 24 and on March 16, 2022, via Zoom (virtual meeting), brought together nearly 90 participants from the Science and Fisheries Management sectors, industry, academia, environmental non-governmental organizations and Indigenous groups. These proceedings detail the essential parts of the presentations and discussions held during the meeting, as well as the recommendations and conclusions made.

INTRODUCTION

The Quebec and Newfoundland and Labrador regions of the Department of Fisheries and Oceans (DFO) are responsible for assessing the stocks of many fish and invertebrate species harvested in the Estuary and Gulf of St. Lawrence. Most of these stocks are assessed periodically as part of a regional or zonal advisory process. This document consists of the proceedings of the zonal meeting on the assessment of redfish stocks in Units 1 and 2 held from January 21 to 24 and on March 16, 2022 via Zoom (virtual meeting).

This assessment was requested by the Fisheries Management Branch to provide the Minister with detailed advice on the status of Unit 1 and 2 redfish to inform management decisions for the 2022–2023 and 2023–2024 fishing seasons. These proceedings report on the main points of the presentations and discussions that resulted from the zonal review. Appendices 1, 2 and 3 present the terms of reference for the review, the list of participants, and the agenda, respectively. The proceedings also outline the recommendations made by the meeting participants.

RESOURCE ASSESSMENT

The meeting was chaired by Marie-Julie Roux and Keith Lewis. Marie-Julie Roux went over the objectives and process for the science review, as well as the role of the participants. The terms of reference and agenda were presented. Attendees were then asked to introduce themselves.

DESCRIPTION OF THE FISHERY

Caroline Senay described the fishery for Unit 1, and Bob Rogers did the same for Unit 2. Redfish landings in 2020–2021 totaled 1,130 t in Unit 1 (20% of the combined quota for the experimental and index fisheries) and 5,787 t in Unit 2 (68% of the TAC). A large number of legal-sized fish measuring between 22 and 26 cm have entered the fishery in Unit 1 (since 2018) and Unit 2 (since 2019). The annual landed bycatch is a small proportion of the total landings in the redfish fishery. Bycatch includes commercial species and species of conservation concern. The impact of bycatch in the redfish fishery has not been assessed for all species. Fishing at depths greater than 300 m could result in a reduction in catches of *S. fasciatus* in all fishing areas, except the Laurentian Fan, and a reduction in catches of small (<22 cm) redfish.

Comments were made in relation to Unit 1:

- With regard to the standardization of CPUE, it was noted that both variables (division and region) are significant and explain something different.
- It appears necessary to distinguish between the index fishery and the experimental fishery in terms of data concerning landings, effort, bycatch, etc. It was suggested that the index fishery indices be examined without including the experimental fishery. Otherwise, the combined index (index and experimental fisheries) should be interpreted with caution.
- Several participants indicated that the experimental fishery may not be representative of what would happen in a commercial fishery and yields might be different in the context of a commercial fishery.
- A concern was raised regarding the bycatch of small redfish by shrimpers (about 200 t in recent years). However, compared to all the small redfish present in the scientific survey, this catch by shrimpers appears negligible. It was noted that there is a protocol for small fish in the various fisheries.

- It was mentioned that the picture of the bycatch situation would not change much with the addition of the experimental fishery data. However, it was suggested that the data from the series (1999–2021) be presented in blocks of 4-5 years and that the last few years, which include the experimental fishery, be treated separately from the rest of the time series. Since 2018, more experimental fishing has been carried out.
- It was noted that there is an issue with data flow in the experimental fishery that makes it difficult to distinguish between datasets.
- Questions were asked regarding the trade-off between flexibility and usefulness in data collection in the experimental fishery. Certains participants mention however that data collection is a key objective of an experimental fishery. It was pointed out that this is an initiative of Ottawa fisheries managers. Science does not intervene in this fishery.
- Concerns were raised regarding the potential impact on other species of a directed fishery. However, it was mentioned that the picture of the bycatch situation presented here may not be accurate. According to some industry members, if profitability was ensured by the target species, in this case redfish, fishers might behave differently. The current picture of the bycatch situation may represent maximum values, which may be related to economic concerns.
- However, the list of species is still useful as it identifies species that are likely to be taken as bycatch in a commercial fishery.

With respect to Unit 2, the following comments were made:

- Concerns were raised about the updating of databases and the process of correcting some of the errors in relation to what was presented during earlier assessments.
- Several participants suggested that landings and CPUE did not reflect reality, particularly in recent years. It was noted that the 2021 data are preliminary.
- As for the standardization of CPUE, clarifications on the inputs appear necessary. The fishery performance index (standardized CPUE) is considered to be not very informative.
- It was also suggested that the length frequencies be reviewed to ensure that they represent all landings. Questions were raised about the source of the data and the observer coverage. Are they truly representative of the fishery? These data must be interpreted with caution.
- Temporal and spatial changes and changes in vessel size were noted in relation to effort patterns; these may influence bycatch composition and trends.
- In general, there is a lack of confidence in the commercial fishery data for Unit 2.
- With regard to the bycatch figures presented, the importance of distinguishing between figures based on dockside sampling and data from at-sea observers was noted.
- Although these data were revised following the last assessment, there is still a great deal of confusion about what is being presented and the source of the data (ZIFF, MARFIS, logbooks). More work seems necessary to clarify this. The entire process, from data collection to extraction and analysis, must be reviewed and transparently documented.

EXPERIMENTAL FISHERY TEST

Erin Carruthers gave a presentation on the experimental fishery in Unit 1 in 2020–2021. One objective of this fishery was to test different types of fishing gear in order to reduce bycatch.

- Preliminary analysis appear to show encouraging results for the experimental bottom trawl. Results for 2020 and 2021 appear to show trends of reduced bycatch compared to the standard trawl, however further analysis is required to confirm. However, different approaches seem to be needed to limit Atlantic halibut bycatch.
- Some clarifications were requested on the experimental trawl.
- For mid-water trawls, the seasonal effect on catch efficiency has not yet been evaluated.
- Information on size-selection is not yet available but would be useful.

REDFISH IDENTIFICATION METHOD

The presentation by Caroline Senay and Hugues Benoît focused on the method for identifying the two species of redfish (*S. mentella* and *S. fasciatus*). Both species are morphologically similar and have been identified as "*Sebastes* spp." in stock assessments (until 2010) as well as in the fishery. Since 2010, the malate dehydrogenase locus (MDH-A*) was used to genetically identify individual redfish species and to determine the probability distribution of the anal fin ray (AFR) counts that are used to estimate the species composition of catches. It has been shown that redfish identification based on MDH-A* can lead to errors in AFR distributions. In addition, overlapping distributions of inferred AFR for the two species were found to bias estimates of species composition, particularly when one species dominated the composition of a sample. Other potential approaches will eventually be examined. There is a need to continue to improve the estimation of species composition of catches to better guide sustainable fishery strategies.

- There was agreement that adequate training on AFR counts improves data accuracy.
- It was pointed out that it is essential to ensure validation and representative distribution of the samples.
- It was specified that the samples are grouped in size categories during the Unit 1survey to obtain information by size class.
- The participants asked about the bias in the species identification process when *S. mentella* dominates a sample. The magnitude of this bias is not quantifiable, but suggests that *S. fasciatus* biomass may be overestimated in research surveys.
- Some participants felt that the method is very consistent and that this bias may not be so significant. It was mentioned that the magnitude of the increase in *S. fasciatus* is probably greater than the current bias. It seems clear that *S. fasciatus* has increased in recent years. Other participants said that great care must be taken. It is important to continue work that will reduce this bias or better estimate it.
- It was added that the tows giving proportions of 0 and 1 are not necessarily biased, as they may be due to the depth of capture. It would be useful to have depth information for tows.
- It was noted that the results should be considered in relative terms. No method is perfect. Uncertainty will be taken into account in this assessment.

SCIENTIFIC SURVEYS

The indices from the scientific surveys are provided for both units and both species. The estimated total biomass in the Unit 1 (2021) surveys for *S. mentella* (2,805 kt [2,133–3,549; 95% CI]) remained among the highest values in the time series beginning in 1984, while the value for *S. fasciatus* (420 kt [118–722 95% CI]) was the highest recorded. Fish larger than

the minimum legal size (22 cm) accounted for a large proportion of the total survey biomass in Unit 1 in 2021 (93% for *S. mentella* and 85% for *S. fasciatus*).

- It was specified that the figures showing the distribution of the new *S. mentella* and *S. fasciatus* cohorts are not derived from systematic sampling, but rather from stations where there were many small fish.
- It was noted that research on recruitment is under way at UQAR and includes sporadic recruitment events in relation to environmental factors (e.g., CIL, prey).

The estimated total biomass in Unit 2 (2018 – most recent calibrated survey) for *S. mentella* (805 kt [607–1,089 kt; 95% CI]) was the highest value recorded in the time series beginning in 2000, while the value for *S. fasciatus* (106 kt [0–352 kt; 95% CI]) was below the series average. Fish larger than the minimum regulatory size (22 cm) accounted for a large fraction of total survey biomass in Unit 1 in 2021 (93% for *S. mentella* and 85% for *S. fasciatus*) and 89% of the total survey biomass of both species in Unit 2 in 2018.

- Comparative fishing will be required before the 2020 survey data can be integrated with the rest of the series.
- A problem was noted in the AFR counts by samplers from the latest surveys. In order to improve the AFR counts in future surveys, better training of field crews is recommended.
- Concerns were raised about the small difference in size between the individuals in the 2018 survey and those observed in the 2021 fishery, which targeted larger fish.
- It was pointed out that the difference in depth generally observed between the two species does not apply to the Laurentian Fan, where *S. fasciatus* is found at a greater depth.
- It was considered useful to review all of the available surveys even if they cover only a portion of Unit 2. They can still provide information, especially on recruitment.

ACOUSTIC SURVEY

Shani Rousseau presented the method and preliminary estimates of *Sebastes* spp. biomass based on the 2019–2020 acoustic data in the northern GSL. All three abundance indices (acoustic 1, acoustic 2, trawl) suggest a decrease in redfish total biomass between 2019 and 2020. Allan Debertin presented the method and preliminary biomass estimates of *Sebastes* spp. for the acoustic survey conducted in Unit 2. The results obtained were similar to those observed for the trawl.

- For Unit 1, the maximum extent of the acoustic blind zone was estimated to be 2.2 m in deeper areas. A portion of the redfish is located in the acoustic blind zone, and a portion was found higher up. In general, the meeting was fairly confident in the data presented.
- Some participants asked about Silver hake, which is not present in the data presented for Unit 2. However, it was confirmed that there was a lot of Silver hake in the catches. This data needs to be validated in order to update the results presented for the next assessment.
- It was noted that it may be unrealistic to assume that all acoustic backscatter corresponds to redfish in Unit 2. The current acoustic index for unit 2 is a biomass index, but not necessarily an index of redfish biomass.
- It was noted that the acoustic index is not currently used to assess the stock. Additional work is required.

MATURITY OGIVES AND REFERENCE POINTS

Caroline Senay and Caroline Brûlé provided an update of knowledge on redfish reproduction in a changing environment. The estimate of spawning stock (spawning stock biomass; SSB) has been based on outdated inputs including size at maturity. In order to update the maturity ogives, genetic identification of the species was conducted and reproductive stages were determined based on histology and macroscopic examination of the gonads. A logistic model was used to revise the maturity ogives based on the proportion mature at length relationship derived based on histological information. A standardized visual chart was developed, which included three maturity categories for females (developing, maturing and mature, post-ovulatory/recovering) and three categories for males (immature, maturing/mature, recovering). This chart was used to compare earlier (1990s) and recent (2018-19) maturity information for males and females of the two species combined.

The L_{50} values derived from both approaches (histology and macroscopic appearance) yielded similar results. In general, a decrease in the L_{50} is observed relative to the results obtained in the past, i.e. redfish reach maturity at a smaller size than before. These new ogives have an impact on SSB estimation and redfish status evaluation relative to empirical reference points determined in 2019. Based on the new ogives, the revised limit reference points (LRP) are 44 kt for *S. mentella* and 30 kt for *S. fasciatus*.

- Participants questioned the scope of the results, given that the majority of the samples are from Unit 1. There are few samples available from Unit 2 to inform the new ogives.
- It was noted that the period when the sampling was carried out (August) could influence the results. Winter sampling is planned in order to improve the study.
- Participants asked about the possibility of exploring alternative models and how best to present the results in the assessment (e.g., by sex, by species).
- With respect to the impact of the new ogives on the status of the species, based on the best available information, especially the new ogives, *S. fasciatus* will move from the cautious zone to the healthy zone. Some participants wondered if these results could be used to trigger a re-examination of the species' status by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). However, participants wanted to ensure that uncertainty was minimized.
- Moreover, considering the possible overestimation of *S. fasciatus*, it seems premature to comment on the status of *S. fasciatus*. Even if it is conceivable that there is an upward trend, it cannot be stated with certainty that the stock is in the healthy zone.
- Questions were asked about the conditions favourable for redfish survival and recruitment. Various factors appear to be involved (e.g., prey, CIL thickness, warming), but the mechanism involved remains to be unclear.
- The participants discussed whether the results of this study should be integrated into the present review. Some participants felt that it would be beneficial to integrate the new data, as it is much more current. In addition, several sensitivity analyses have already been performed and have not shown significant differences. Some participants felt that additional validation was needed.
- It was noted that the visual chart could allow for the L_{50} to be adjusted each year.
- There seems to be a consensus in support of the new ogives and their use starting in 2011.

DIET

The presentation by Laurie Isabel focused on the diet of redfish and was based on the examination of stomach contents. The samples are from the multidisciplinary survey and cover two periods: 1993–1999 and 2015–2021. The diet of redfish varies with their size. Small redfish consume more zooplankton, while large redfish consume shrimp and fish. In both periods, northern shrimp becomes an important prey species for redfish 25 cm and over. An estimate of consumption of northern shrimp was calculated for successive periods. According to this estimate, there has been an increase in consumption of this species since 2017. However, there are several sources of uncertainty (e.g., regurgitation, value not corrected for catchability, ratio used). Although the estimates remain relative and should be viewed with caution, the increasing trend appears to be real.

- It was noted that these are summer samples, which may increase uncertainty. Collection of winter samples is planned.
- Industry reported that the shrimp tend to concentrate at the head of the channels and, that there is a simultaneous movement of redfish towards the head of the channels.
- Industry noted that in 2020 redfish were more pelagic, which may explain the small decrease in consumption observed that year.
- It was expected that the increase in redfish size would lead to a decrease in spatial overlap between redfish and northern shrimp (and thus shrimp consumption), but this was not observed.
- It was suggested that empty stomachs be excluded when the analyses are performed. It would be easier to compare periods and size classes, and this would not affect consumption estimates.
- Concerns were raised about the impact of redfish on northern shrimp, considering the overlap between these species and the increasing trend in consumption. Participants expressed the hope that the ecosystem approach will provide opportunities for discussion in the face of future challenges.

IMPACT OF ENVIRONMENTAL CHANGES ON REDFISH

Denis Chabot presented the impacts of deep water warming, hypoxia and acidification on redfish physiology. Under the RedTanks project, divers have captured redfish and brought them to the surface through a staged decompression approach (decompression stops) (800 fish in 2019 and over 200 in 2021). Genetic tests showed that almost all of these fish are *S. fasciatus*. However, the results could probably be applied to *S. mentella* as well. The model detected a significant effect of temperature, including a slight decrease in growth when the temperature exceeds about 6 °C, and showed that standard metabolic rate (SMR), maximum metabolic rate (MMR), and aerobic scope (AS) increase linearly with increasing temperature in the 2.5–10 °C range. In addition, redfish become more sensitive to hypoxia with increasing temperature. Aerobic scope and growth decrease significantly as the threshold is approached.

- Participants asked how the results of the RedTanks study can be related to the decrease in growth observed in the current population. The projections for deep channels point to even warmer water temperatures and more hypoxic conditions.
- It was pointed out that the decrease in growth observed when the temperature higher than 6 °C could be related to the chemical reactions involved in digestion (rather than to the availability of oxygen), which may be less efficient at this temperature.

- The possible contribution of an UQAR publication on transcriptomic data was highlighted. Temperature is the most influential variable in gene expression, even with small variations.

GROWTH PROJECTION

Caroline Senay showed that 82% of the biomass for the 2011 cohort should have consisted of fish larger than 25 cm based on previous growth curve research; however, this was not the case. The available information indicated a decrease in maximum size (Linf). Projections based on growth parameters calculated for the 1980 cohort are no longer valid; therefore, no growth projections were presented. Individuals from the strong cohorts of *S. mentella* and *S. fasciatus* from 2011 to 2013 are currently showing reduced growth potential and are maturing at smaller sizes than the strong cohorts observed in the past.

- The participants agreed that this cohort appears to grow and mature differently than that of the 1980s.
- It was noted that the mechanisms behind the observed changes in stock growth and maturity are unknown but probably involve density-dependence and environmental effects in a context of low exploitation rates.
- Industry questioned the market's focus on size.
- Industry members felt it was unfortunate that no advisory committee meeting has been scheduled following the present meeting, given that the data presented show that we are in a whole new ball game and possibly at a crossroads.

CONCLUSION

SUMMARY

The key points of the review were presented, and the participants commented on them. Only comments related to content are reported.

- In the key point concerning landings, it was noted that these are the landings for 2020–2021. The values associated with landings were corrected. For Unit 1, "TAC" was replaced by "quota." Landings from the index and experimental fisheries were aggregated for Unit 1. It is important to keep the main message that landings are below the quota and TAC.
- In the key point concerning recruitment, reference to the strong cohorts of 2011–2013 was avoided because the information is not as clear for Unit 2. It was proposed that it should be mentioned that a large number of legal-sized fish (between 22 and 26 cm long) have entered the fishery in Unit 1 (since 2018) and Unit 2 (since 2019).
- It was decided not to present a key point on the CPUE.
- In terms of the key point regarding bycatch, the participants agreed that it should be mentioned that bycatch is a small proportion of the total landings in the redfish fishery, without specifying the percentage (less than 10%). The list of species was replaced by a simple statement that bycatch includes commercial species and species of conservation concern. It was noted that the impact of bycatch in the redfish fishery has not been assessed for all species.
- In the key point on strategies for reducing catches of non-target species and small redfish in the redfish fishery, there appeared to be some confusion, as this point encompasses different aspects that were covered. After discussion, the information was restructured by

stating that fishing at depths greater than 300 m may reduce catches of *S. fasciatus* in all fishing areas except the Laurentian Fan and may also reduce catches of small (<22 cm) redfish.

- With respect to the simulation of bias in the species identification process and the available genetic information on the relative abundance of the two species, it was pointed out that this suggests that *S. fasciatus* may be overestimated in the research surveys.
- For the estimated total biomass, it was decided one key point should be presented for each unit. For Unit 2, the estimated total biomass for the most recent calibrated survey (2018) was presented.
- In another key point, it was deemed important to keep the information on the percentage of total biomass that corresponds to redfish larger than the minimum legal size (22 cm).
- After a discussion on the role of Science versus Fisheries Management, the participants agreed to include a key point indicating that the high biomass of *S. mentella* would allow for an increase in catches, but a cautious approach is necessary with respect to *S. fasciatus* and bycatch.

The participants formulated the following recommendation:

- In 2021, the SSB of *S. mentella* was in the healthy zone according to the proposed USR. The magnitude of the increase in the SSB of *S. fasciatus* is uncertain, but evidence indicates that the stock is at least above the LRP.
- The short-term outlook for redfish stocks in Units 1 and 2 is generally positive. The high biomass of *S. mentella* would allow for an increase in catches, but caution is in order for *S. fasciatus* and bycatch.

UNCERTAINTIES

A few sources of uncertainty are mentioned:

- Stocks structure and distribution/movements
- Factors affecting the perception of stock status, including species distinction, survey trawl catchability and acoustic index development
- Stocks productivity: recruitment and growth and response to environmental variables
- Fisheries bycatch and other effects on ecosystem

Recommendations with regards to data and samples collection in commercial fisheries:

- Need to improve and standardize data flows, quality checks, samples delivery and AFR-counts (rays) validation
- Need to improve the documentation, validation, transparency and reproducibility of analyses performed in support of stock status assessment

RESEARCH PLAN

Theme A. Redfish productivity and their sustainable harvesting

Sub-topic A1. Abundance and distribution of redfish stocks

- DFO survey in August in the northern Gulf of St.-Lawrence – DFO (Core Program)
- Industry survey in September every 2 years in Unit 2 (2022) – AGC

- DFO spring survey south of Newfoundland – DFO (Core Program)

Note : Anal fin rays count should be done in all surveys.
Comparative survey in Unit 2 for the AGC survey.
Samples of fish for species identification based on genetics.

- Winter groundfish trawl survey in the Gulf of St. Lawrence and Laurentian channel – DFO (C-68, 2022-2024)

Note : Look at distribution of groundfish during winter.
Redfish maturity stage during winter.

- Acoustic index development for redfish biomass – DFO (FSCP, 2021-2023)

Note : There is a proportion of redfish above the bottom trawl used in the surveys.
Assess the catchability of surveys.
Analyze more years of acoustic survey data.

- An approach to estimate the composition of cryptic species in commercial and scientific catches and its integration in stock assessments: Units 1 and 2 redfish – DFO (CSRF, 2021-2023)

Note : Update the AFR distributions.
Update the method to split the 2 redfish species in the surveys.
Incorporating and propagating the uncertainty in the surveys time series.

- Redfish (*Sebastes mentella* and *S. fasciatus*) maturity ogive updated – DFO (FRCP, 2018-2020)

Note : Publish results
Add more data from gonad collection in Unit 2
Collect gonads or use the visual chart during the winter survey (2022-2024)

- Develop a reliable method for age reading from redfish otolith – UQAC (Contribution program, 2021-2023)

- Redfish commercial catches species composition – DFO (Nature Legacy fund, 2019-2022)

Note : At-sea observers training and support.
Data validation and management.

Sub-topic A2. Redfish trophic relationships

- Study of summer diets of major groundfish from the northern Gulf of St. Lawrence survey – DFO (Core Program)

- Winter diet of redfish. Winter survey in the Laurentian channel and the northern Gulf of St. Lawrence (2022-2024) – DFO (C-68)

Note : No data from Unit 2.

Sub-topic A3. Environmental factors influencing the redfish's productivity

- Status assessment of the physical and biochemical oceanographic environment through the Atlantic Zone Monitoring Program to detect, monitor and predict changes in marine environmental productivity and condition – DFO (Core Program)

- Groundfish return in the Estuary and northern Gulf of St. Lawrence – DFO and RAQ (Partnership Fund, 2017-2020)

- REDTANKS: Understand the environmental needs and the consumption of shrimp by redfish (*Sebastes* spp.) with experiments in tanks – DFO (Results funds, 2019-2022)

Note : Ecophysiology experiments: metabolism, growth, and tolerance to temperature, pH and dissolve oxygen.

Theme B. The impacts of fishing on the ecosystem

Sub-topic B1. The habitat and sensitive benthic communities

- Maintain and justify scientific monitoring activities (DFO and AGC surveys) in marine areas and refuges.

Sub-topic B2. Not targeted species in the fishery

- Assessment of the importance of bycatch in the redfish fishery by analyzing data from activities of the monitoring by the At-Sea Observer Program and data from commercial fishing (logbook) – DFO (Core Program)

Note : Data from index and experimental fisheries may not be fully representative of what will happen in commercial fishery in Unit 1.
Consider spatial, seasonal and fleet variations in bycatch analysis.

APPENDIX 1- TERMS OF REFERENCE

Assessment of Redfish Stocks (*Sebastes mentella* and *S. fasciatus*) in Units 1 and 2 in 2021

Zonal Advisory Meeting - Quebec and Newfoundland & Labrador Regions

February 21-24, 2022
Virtual meeting

Chairpersons : Marie-Julie Roux and Keith Lewis

Context

Redfish in Units 1 and 2 consists of two different stocks: *Sebastes mentella* and *S. fasciatus*. These stocks are distributed in the Gulf of St. Lawrence, in the Laurentian Channel and Laurentian Fan Regions south of Newfoundland, and northeast of Nova Scotia. Redfish in Unit 1 has been under a commercial fishery moratorium since 1995. An index fishery has been authorized since 1998, with a total annual quota of 2,000 metric tonnes (t) since 1999, and an experimental fishery has been authorized since 2018. With respect to Unit 2 Redfish, the TAC has been annually set at 8,500 t per year since 2006. The recent appearance of three large cohorts in both Units (2011, 2012 and 2013) has increased the abundance and biomass of Redfish above the historical average. Based on the last assessment (DFO 2020), *S. mentella* and *S. fasciatus* were respectively in the healthy and cautious zone of the DFO Precautionary Approach Framework. The impending recruitment to marketable size of 2011-2013 Redfish across Units 1 and 2 is expected to affect the perception of stock status and fishing opportunities. The current assessment is requested by the Fisheries Management Branch to provide the Minister with detailed advice on the status of Units 1 and 2 Redfish in order to inform management decisions for the 2022-23 and 2023-24 fishing seasons.

Objectives

Provide scientific advice on the status of *S. mentella* and *S. fasciatus* stocks in Units 1 and 2. This advice will include:

- Ecosystem considerations including relevant summaries of oceanographic conditions and ecological interactions (e.g. predator, prey);
- Description of the biology of Units 1 and 2 Redfish;
- Description of Redfish fisheries in Units 1 and 2 including landings per NAFO divisions, months and gears, length frequencies, and standardised catch per unit effort (CPUE) when available;
- Description of bycatch in the Redfish fisheries based on logbook and at-sea-observers data including bycatch percentages (bycatch/Redfish biomass), distribution maps, depth profiles, and length frequency for the main species of concern (e.g. main commercial species, species having a COSEWIC status);
- Possible strategies for the reduction of non-targeted bycatch and small Redfish catch (less than 22 cm) in Redfish fisheries in Units 1 and 2;
- Update of abundance and biomass indices from industry and DFO surveys, including size structure and geographic distribution of catches;
- Implementation of the new maturity ogives to estimate spawning stock biomass;

- Update of stock status relative to the reference points for each species;
- Provide short-term stock perspectives based on available indicators;
- Present progress and results of ongoing scientific projects to better inform Redfish stock assessment (Acoustic indicators, RedTanks laboratory experiments, Catch monitoring);
- Identification of key knowledge gaps and research priorities.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document(s)

Participation

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

References

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Senay, C., Ouellette-Plante, J., Bourdages, H., Bermingham, T., Gauthier, J., Parent, G., Chabot, D., and Duplisea, D. 2021. Unit 1 Redfish (*Sebastes mentella* and *S. fasciatus*) stock status in 2019 and updated information on population structure, biology, ecology, and current fishery closures. DFO Can. Sci. Advis. Sec. Res. Doc. 2021/015. xi + 119 p.

APPENDIX 2- LIST OF PARTICIPANTS

Name	Affiliation	Jan. 21	Jan. 22	Jan. 23	Jan. 24	March 16
Aylward, Molly	PEIFA	x	-	-	-	-
Bayes, Shannon	Marine Institute, Memorial Univ.	x	-	-	x	-
Beaton, Eugene	Inverness South Fishermen's Ass.	-	-	-	x	x
Benoît, Hugues	DFO – Science	x	x	x	x	x
Bermingham, Tom	DFO – Science	x	x	x	x	x
Bernatchez, Claudio	ACPG	x	-	-	-	x
Boudreau, Mathieu	DFO – Science	x	x	x	x	-
Boudreau, Paul	Madelipêche	x	x	x	x	x
Bourdages, Hugo	DFO – Science	x	x	x	x	x
Bourdages, Yan	ACPG	x	x	x	x	-
Bottke, Lauren	DFO – Fisheries Management	x	x	x	x	x
Boussens-Dumon, Grégoire	UQAR	-	x	x	x	x
Brassard, Claude	DFO – Science	x	x	x	x	x
Brown-Vuillemin, Sarah	UQAR	-	-	x	-	-
Brûlé, Caroline	DFO – Science	x	x	x	x	x
Burns, Corinne	UQAR	x	x	x	x	x
Butler, Renae	Ass. of Seafood Producers	x	x	x	x	-
Byrne, Vanessa	Province – NL	x	x	x	x	x
Carruthers, Erin	FFAW	x	-	-	-	x
Chabot, Denis	DFO – Science	x	x	x	x	-
Chamberland, Jean-Martin	DFO – Science	x	x	x	x	-
Chlebak, Ryan	DFO – Science	-	-	-	x	-
Coussau, Lola	UQAR	x	-	x	-	-
Cyr, Charley	DFO – Science	x	x	x	x	x
Debertin, Allan	DFO – Science	-	x	x	x	-
Delaney, Paul	Madelipêche	-	x	x	x	x
D'entremont, Alain	Mersey Seafoods	x	x	x	x	-
Desgagnés, Mathieu	MPO – Sciences	x	x	x	x	-
Deslauriers, Marcelle	DFO – Fisheries Management	x	-	-	-	-
Dewland, Jennifer	PEIFA	x	x	x	x	x
Doherty, Penny	DFO – Fisheries Management	x	x	x	x	x
Dubé, Sonia	DFO – Science	x	x	x	x	x
Duplisea, Daniel	DFO – Science	x	x	x	x	x
Dwyer, Karen	DFO – Science	x	x	x	x	x
Dwyer, Shelley	DFO – Fisheries Management	x	x	-	x	x
Edgar, Leigh	DFO – Fisheries Management	x	-	-	-	-
Élément, Patrice	ACPG	x	-	x	x	x
Genge, Rendell	FFAW	x	x	x	x	-
Girard-Robert Mathilde	DFO – Science	-	x	x	x	-
Grelon, Damien	Merinov	x	x	x	x	-
Guitard, Joëlle	UQAR	x	-	x	x	-
Haché, Luc	Midshore Independant Groundfish Vessel Operators	x	x	x	-	-
Hébert, Denyse	DFO – Fisheries Management	x	-	-	-	-
Hewitt, Michelle	Province – PEI	x	x	x	x	x
Isabel, Laurie	DFO – Science	x	x	x	x	x
Jubinville, Isabelle	Oceana	x	x	x	x	-
Juillet, Cédric	DFO – Science	x	-	-	-	-
Kumar, Rajeev	DFO – Science	x	-	x	-	-
Labbé-Giguère, Stéphanie	DFO – Fisheries Management	x	x	x	x	x
Lacasse, Olivia	DFO – Science	x	-	-	-	-
Lanteigne, Jean	ACAG	-	x	x	-	-
Lapierre, Daniel	DFO – Fisheries Management	x	x	x	-	x
Lavallée, Dean	Fisher LNS	-	x	-	-	-
Leblanc, Léonard	GNSFPB	x	x	-	x	-

Name	Affiliation	Jan. 21	Jan. 22	Jan. 23	Jan. 24	March 16
Leung, Christelle	DFO – Science	x	x	x	x	-
Lewis, Keith	DFO – Science	x	x	x	x	x
Loboda, Sarah	DFO – Science	x	-	-	-	-
MacPherson, Ian	PEIFA	x	-	-	x	-
Mallet, Pierre	DFO – Fisheries Management	x	x	x	x	x
Mccutcheon, Alexandre	DFO – Fisheries Management	x	-	-	-	-
Mugridge, Adam	Province – Nova Scotia	x	-	x	-	x
Mussells, Claire E.	DFO – Science	x	-	x	-	-
Nadeau, Paul	APBCN	x	-	-	x	x
Nozères, Claude	DFO – Science	x	x	x	-	-
Osborne, Derek	DFO – Science	-	x	-	-	x
Parent, Geneviève	DFO – Science	x	-	-	-	-
Patterson, Maryline	MAPAQ	x	-	-	x	x
Pelletier, Claude	Province – New Brunswick	x	x	x	x	x
Poissant, David	AGHAMM	x	-	x	x	-
Pond, Nancy	DFO – Fisheries Management	x	x	-	x	-
Rayner, Gemma	Oceansnorth	x	x	x	x	x
Rideout, Rick	DFO – Science	x	x	x	x	-
Robert, Dominique	ISMER/UQAR	x	x	x	-	-
Rogers, Bob	DFO – Science	x	x	x	x	x
Rolland, Nicolas	DFO – Science	x	x	x	x	-
Rousseau, Shani	DFO – Science	x	x	x	x	x
Roussel, Eda	FRAPP and ACAG	-	x	x	x	-
Roux, Marie-Julie	DFO – Science	x	x	x	x	x
Riley, Cyrena	DFO – Science	-	-	x	-	-
Senay, Caroline	DFO – Science	x	x	x	x	-
Small, Daniel	DFO – Science	x	x	x	x	-
Spingle, Jason	FFAW	x	x	x	x	x
Tamdrari, Hacène	DFO – Science	x	x	x	x	-
Thériault, Stéphane	ACPG	x	-	-	-	-
Varkey, Dyvia	DFO – Science	x	x	x	x	x
Vascotto, Kris	Atlantic Groundfish	x	x	x	x	x
Watts, Taylor	GNSFPB	x	x	x	-	x
Wheeland, Laura	DFO – Science	x	x	x	x	x
Winger, Paul	Memorial Univ.	x	-	x	-	x

APPENDIX 3- AGENDA

Assessment of redfish stocks in Units 1 and 2 in 2021

Chairs: Marie-Julie Roux and Keith Lewis

Rapporteur: Sonia Dubé

February 21-24, 2022

Zoom virtual meeting

Time (EST)	Subject	Speaker	Duration
Day 1: Monday, February 21, 2022			
10:00	Introduction and roundtable	Co-chairs	60 min
11:00	Biology and ecosystem	Caroline Senay	30 min
11:30	Lunch break		30 min
12:00	Fishery and bycatch Unit 1	Caroline Senay	60 min
13:00	Commercial fishery and bycatch Unit 2	Bob Rogers	60 min.
14:00	Experimental fishery trials Unit 1	Erin Carruthers	60 min
15:00	End of day 1		
Day 2: Tuesday, February 22, 2022			
10:00	Redfish identification method and bias	Caroline Senay / Hugues Benoit	60 min
11:00	Catch monitoring project update	Caroline Senay	30 min
11:30	Lunch break		30 min
12:00	Surveys Unit 1	Caroline Senay	60 min
13:00	Surveys Unit 2	Bob Rogers	60 min
14:00	Acoustic preliminary results	Shani Rousseau / Allan Debertin	60 min
15:00	End of day 2		
Day 3: Wednesday, February 23, 2022			
10:00	Maturity ogives and reference points	Caroline Senay / Caroline Brûlé	90 min
11:30	Lunch break		30 min
12:00	Diet	Laurie Isabel	45 min

Time (EST)	Subject	Speaker	Duration
12:45	Effect of climate change on growth	Denis Chabot	45 min
13:30	Growth projection	Caroline Senay	45 min
14:15	Incertainties and research priorities	Caroline Senay	45 min
15:00	End of day 3		
Day 4: Thursday, February 24, 2022			
10:00	Bullets / SAR	All	90 min
11:30	Lunch break		30 min
12:00	Bullets / SAR	All	180 min
15:00	End of meeting		