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Canadian Science Advisory Secretariat (CSAS)

Proceedings Series 2024/009

Maritimes Region

Proceedings of the Maritimes Regional Advisory Meeting of the Assessment of Atlantic Wolffish Population Trends in the Maritimes Region

Meeting dates: February 9–10, 2022

Location: Virtual Meeting

Chairpersons: Leslie Nasmith and Rabindra Singh

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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.

Published by:

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

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Department of Fisheries and Oceans, 2024

ISSN 1701-1280

ISBN 978-0-660-69834-2 Cat. No. Fs70-4/2024-009E-PDF

Correct citation for this publication:

DFO. 2024. Proceedings of the Maritimes Regional Advisory Meeting of the Assessment of Atlantic Wolffish Population Trends; February 9-10, 2022. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2024/009.

Aussi disponible en français :

MPO. 2024. *Compte rendu de la réunion sur les avis scientifique de la région des Maritimes de l'évaluation des tendances des populations de loups atlantiques dans la région des Maritimes; du 9 au 10 février 2022. Secr. can. des avis sci. du MPO. Compte rendu 2024/009.*

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SUMMARY

Atlantic Wolffish (*Anarhichas lupus*) (listed as a species of Special Concern under the *Species At Risk Act* [SARA]) underwent steep declines in both abundance and area of occupancy over much of its range from the 1980s until the mid-1990s. Maritimes Ecosystem Research Vessel (RV) surveys (North Atlantic Fisheries Organization [NAFO] Divisions 4X and 4VW) suggest that abundance continued to decline on the Scotian Shelf in the 2000s and remains at low levels. Numerous factors make it difficult to confidently assess trends within the population and there has been no assessment for several years. Other data sources (such as other surveys, landings and observer data) exist that could provide information on the current status of Atlantic Wolffish. This regional peer-review meeting sought to provide answers to the following questions: (a) Given the data sources available (e.g., Fisheries Observer data, SARA logbooks, other Fisheries and Oceans [DFO] surveys, industry data), is it possible to develop a reliable biomass index for the Scotian Shelf portion of the population? (b) Can the index be used to understand population trends over time, and to assess and track fishing mortality over time? (c) What does the data reveal about species distribution patterns, potential drivers of population decline, range shifts, and/or sustained low abundances? Participants in this virtual meeting held from February 9–10, 2022, included, DFO Science, DFO Ecosystem Management, Province of Nova Scotia, Aboriginal communities / organizations, industry, and non-governmental organizations.

INTRODUCTION

Atlantic Wolffish (*Anarhichas lupus*) (listed as a species of Special Concern under the *Species At Risk Act* [SARA]) underwent steep declines in both abundance and area of occupancy over much of its range from the 1980s until the mid-1990s. Research Vessel (RV) surveys (North Atlantic Fisheries Organization [NAFO] Divisions 4X and 4VW) suggest that abundance continued to decline on the Scotian Shelf in the 2000s and remains at low levels (Simon et al. 2012). However, numerous factors make it difficult to confidently assess trends within the population. The population has not been assessed for several years and other data sources (such as other surveys, landings and observer data) exist that could provide information on the current status of Atlantic Wolffish. This regional peer-review meeting sought to provide answers to the following questions: (a) Given the data sources available (e.g., Fisheries Observer data, SARA logbooks, other Fisheries and Oceans [DFO] surveys, industry data), is it possible to develop a reliable biomass index for the Scotian Shelf portion of the population? (b) Can the index be used to understand population trends over time, and to assess and track fishing mortality over time? (c) What does the data reveal about species distribution patterns, potential drivers of population decline, range shifts, and/or sustained low abundances?

OBJECTIVES

The specific objectives of this Regional Science Peer-Review Process were to:

- Develop a biomass index for the Scotian Shelf portion of the population;
- Examine population trends over time;
- Examine distribution patterns over time;
- Estimate mortality due to fishing over time.

The meeting started with the Co-Chair (R. Singh) introducing himself and Co-Chair L. Nasmith and welcoming everyone. The participants were then asked to introduce themselves. R. Singh briefly described the Canadian Science Advisory Secretariat (CSAS) peer review process and the use of the Scientific Advice for Government Effectiveness (SAGE) Principles and Guidelines. Since the meeting was using Microsoft Teams (MS Teams) as the platform, tips on the effective use of MS Teams were provided. The Terms of Reference with the specific meeting objectives and the Agenda for the two days were reviewed.

See Appendix A for the Terms of Reference. Participants in this meeting included, DFO Science, DFO Ecosystem Management, Province of Nova Scotia, Aboriginal communities / organizations, industry, and non-governmental organizations (see Appendix B for list of participants). This virtual meeting was held from February 9–10, 2022, using Microsoft Teams (MS Teams) (see Appendix C for the Agenda).

ABSTRACT OF THE WORKING PAPER

Assessment of Atlantic Wolffish (*Anarhichas lupus*) Population Trends on the Scotian Shelf
Authors: Elizabetha Tsitrin, Kayla Silver and Daphne Themelis

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed the status of Atlantic Wolffish (*Anarhichas lupus*) as special concern in 2000. The Atlantic Wolffish was added to Schedule 1 of the *Species at Risk Act* in 2003. COSEWIC re-evaluated the status in 2012 and determined its status to remain as special concern.

As the department responsible for the management of aquatic species at risk, Fisheries and Oceans Canada (DFO) undertook this assessment to examine recent trends in abundance and

distribution of the portion of the Atlantic Wolffish population residing on the Scotian Shelf using data from DFO Research Vessel (RV) and industry surveys, commercial landings, at-sea commercial fishing observations and *Species at Risk Act* (SARA) logbooks. Based on the available data, the decrease in abundance of Atlantic Wolffish on the Scotian Shelf reported in the 2012 assessment has persisted over the last decade. Atlantic Wolffish are concentrated on the eastern Scotian Shelf (North Atlantic Fishery Organization [NAFO] Divisions 4VW), the western Scotian Shelf (Division 4X) around Browns Bank and west of German Bank, as well as isolated areas inshore of the 50-fathom line in Divisions 4WX, which have limited sampling. Both immature and mature abundance has declined since 1970. On the northeast peak of Georges Bank (Division 5Z), there is a small aggregation of Atlantic Wolffish that has declined > 90% since 1986, and remains very low today. Although there are no directed fisheries for Atlantic Wolffish in the Maritimes Region, the species is caught as bycatch in other fisheries. Annual landings of wolffish in 5Z and 4VW have been near 4 t since the 1990s; landings in 4X decreased rapidly in the early 2000s, and have remained below 10 t over the past decade. Atlantic Wolffish discards are observed in multiple fisheries; however, estimates of total discards were not determined. The levels of fishing removals from various fisheries are, therefore, not known. The Maritimes Region Ecosystem Summer RV survey has the longest time series and most comprehensive coverage of the Scotian Shelf, making it the primary source to monitor abundance trends and to inform management actions for the species.

DAY 1: FEBRUARY 9, 2022

Rapporteur: U. Goggin

The assessment team presented summaries of the findings and analyses of the available data on Atlantic Wolffish on the Scotian Shelf. Data examined included the DFO Maritimes Ecosystem Research Vessel (RV) surveys from the summer (1970–2020), spring 4VWX (1979–1984), spring 4VsW (1986–2010), spring 4X (2008–2021) and Georges Bank (1987–2021), the Industry -DFO Halibut Longline (1998–2021), Sentinel 4VsW (1995–2021), Maritimes Snow Crab Survey (2004–2021), ITQ (1995–2012) and Inshore Lobster Trawl Survey (2013–2021) industry surveys, as well as observer and commercial landings data in NAFO areas 4VWX (Strata 440–495) and 5Ze. After the presentations by the authors, the reviewers were provided with opportunities to provide comments, seek clarifications, and make suggestions.

The team was asked why the 2021 Summer Ecosystem RV survey data were included in the analyses. A comparative survey using the regular and retiring vessel (Canadian Coast Guard Ship [CCGS] *Alfred Needler*) and the new vessel (CCGS *Capt. Jacques Cartier*) did not occur. The 2021 Summer RV survey was conducted by the new vessel only in 4X and no calibration indices could be developed for comparison with the *Alfred Needler*. It was explained that there appeared to be no dramatic difference in the 2021 data compared to previous years: trends in abundance and distribution were examined using a 3-year geometric mean. Also, calibration factors have not been applied to data earlier in the series when vessels or gear were changed. Discussion followed on whether the 2021 data should be included or excluded. It was agreed that the data from 2018 and 2021 should be removed because there was incomplete survey coverage in 2018 and the 2021 data also came from a new vessel and gear.

A question was raised about whether there was any change in the RV survey sampling protocol for small fish after 1981, or whether there was a sampling gear change. This was because there has been an increase in the number of immature (< 53 cm total length) Atlantic Wolffish recorded in the series through the early 1980s. It is possible that the increase in abundance of immature individuals could be attributed to the changes in gear and handling of samples. It was

explained that the survey from 1970 to 1981 was conducted on a side trawler and the catch was dumped on deck and sorted by the deck crew. Small fish (< 10 cm) may have been washed overboard during sorting. From 1982 onwards, the survey was conducted by a stern trawler and the catch was dumped into a hopper and sorted below deck by the scientific staff. An increase in small individuals of Atlantic Cod and Haddock was noticed in early 2000s. It is not clear if the same trend was observed for Atlantic Wolffish.

During further discussion about the RV survey time series, it was explained that data were collected for all species during a comparative survey in 1982, to be used for developing conversion factors. Factors were only calculated for five species and most of these were very close to one. Therefore, it has become tradition to not apply conversion factors to catches before and after 1982 (with the exception of Silver Hake) for any species including Atlantic Wolffish. The difference in handling protocols of small fish in the early years of the time series is considered to be a larger issue. It was agreed that the figures in the final report would clearly indicate the time series pre-1981 and post-1982.

Data presented but not included in the final report were the annual percentage of sets capturing wolffish, length frequency distributions from RV spring surveys, and log-transformed catch rates. It was decided that the design-weighted area of occurrence (DWAO) was a more appropriate way to examine trends in spatial distribution because the Summer RV survey uses a stratified random design. Length frequency data were also excluded because they were not stratified according to survey design. Log-transformed catch rates were presented to be consistent with the Simon et al (2012) assessment. The data are not normally distributed and r-squared values of < 0.1 indicate very low fit. Adding error bars to the plots for Snow Crab surveys would be helpful since the number of sets has declined. Error bars would be useful in the other plots as well.

Annual commercial landings of Atlantic Wolffish indicate that there was a significant decrease from 2010 in 4X; landings from 4VW and 5Z remained low. The question was raised as to whether this was because there were management changes in those fisheries that would cause the decline in landings of Atlantic Wolffish. No management measures were implemented after 2010 in the directed groundfish fisheries that that might be expected to impact the landings of Atlantic Wolffish. Until 2020, regulations required that caught Atlantic Wolffish be landed. As of 2020, any Atlantic Wolffish that is caught can be discarded at sea.

At-sea observations of Atlantic Wolffish captured during commercial fishing observations were presented to show the proportion discarded vs. retained. It was agreed that at-sea observations from 2021 were incomplete and that the series should be limited to 1978–2020.

Few length frequency data were available from the Industry surveys. Length frequency data were not collected consistently across the years, so it was not clear how representative the data would be. Some length frequency data were available from Halibut, Snow Crab, and Sentinel surveys. Variations are expected in the Halibut longline surveys because hook size can affect the length of Atlantic Wolffish caught. The Maritimes Snow Crab Survey data were examined but lengths were only collected near the Gully and there were no length frequencies for the sets conducted on the rest of the Scotian Shelf.

Concerns were raised that commercial landings, as recorded in the Maritimes Fishery Information System (MARFIS) database over the past 20 years were very low and this could be interpreted that commercial fishing was a low-level threat to Atlantic Wolffish. From the non-target commercial fisheries, however, in the last 10 years it is surprising that wolffish were not being impacted by fishing gear. The data may indicate which fisheries are more likely to impact

Atlantic Wolffish populations. It may be a good idea to add a table to the Working Paper to show these data since the figures do not show this very well.

Landings of Atlantic Wolffish from non-target fisheries are low. Restrictive measures in the groundfish fisheries for Atlantic Wolffish vary by fleet and in some cases by targeted species. Each inshore fixed gear and mobile gear fleet has an annual bycatch cap for Atlantic Wolffish, totaling 35 t for the Maritimes Region. Mid-shore and offshore groundfish fleets have percentage trip limits for Atlantic Wolffish that vary per fleet and directed species. If these fisheries actually landed the maximum of these percentages, the number of Atlantic Wolffish landed would be high. Atlantic Wolffish is not authorized to be landed in the Maritimes Region Lobster fishery. The landings data are not useful to determine which fishery is most likely having an impact on Atlantic Wolffish. If Atlantic Wolffish are caught and kept this would be reflected in the observer data. The other issue is whether observers recorded retained versus caught Atlantic Wolffish. Observers usually record discards. MARFIS data show landed catches, but discards are very mixed, some are very high, and some are very low so there is not enough confidence about those numbers.

A participant questioned whether discards are recorded in *Species at Risk Act (SARA)* logs. Atlantic Wolffish are of Special Concern, so discards are not required to be recorded in such logs. In the SARA logs, the majority of wolffish recorded are Northern Wolffish and Spotted Wolffish. As a result, the logs do not provide a reliable source of discard data for Atlantic Wolffish.

The Industry-DFO Halibut Longline Survey has fixed stations with the same stations being sampled every year (58 stations), so it may be a good idea to examine the same set of stations every year to see if there are any trends in Atlantic Wolffish recorded over time.

It was noted that the lack of mature individuals (> 53 cm total length) in RV survey catches in 4V was puzzling, while lots of juveniles were recorded. A participant also questioned the use of > 53 cm total length as an indicator of maturity. It was explained that other lengths have been reported for other regions but > 53 cm was used to be consistent with earlier assessments in the absence of information specific to the Scotian Shelf. It was suggested that investigating the length at 50% maturity for Atlantic Wolffish on the Scotian Shelf should be a research question. In the Gulf of Maine, Atlantic Wolffish mature around 40 cm, and it is possible that 53 cm is inappropriate for the Scotian Shelf.

For purposes of reporting on trends going forward, it was suggested that Summer RV survey abundance and biomass plots be separated into two areas. Splitting 4VW and 4X will help fisheries management because there are different fisheries in the two different areas.

DAY 2: FEBRUARY 10, 2022

Rapporteur: U. Goggin

Co-Chair, L. Nasmith, started the meeting with a quick summary of the main point that were raised the day before. And then opened the discussion for general comments before the meeting reviewed the draft Science Advisory Report (SAR) that was distributed at the end of Day 1.

Discussion centered on what possible factors may be contributing to the decline in mortality, higher juvenile abundance in the eastern part of the Scotian Shelf, the sustained low adult

abundance, and Atlantic Wolffish distribution patterns. It is not clear from the data if the decline happened first or if the fishing industry lost interest in fishing for Atlantic Wolffish. Two possible causes are change of habitat or ecological conditions. In the Newfoundland and Labrador Region, possible cause of decline for Wolffish was damage to habitat while in the Gulf of Maine the cause was a disturbance of the food source (echinoderms). Wolffish are low producing species, but even with limited human induced mortality the population has not bounded back to normal abundances. There is insufficient information to determine why this is so.

SUMMARY BULLETS

Following the general discussion, Co-Chair L. Nasmith, then led the participants through the draft SAR by first reviewing the Summary Bullets at the beginning of the document.

Based on the previous day's discussion, bullets were either deleted or edited. For example, the statements about log-transformed catch rates were removed from the document since it was not clear if they were correct, and this was first time that log-transformed catch rates for immature Atlantic Wolffish has been connected to sampling processes. In previous years this had not been reported and the trend is captured by biomass. Log-transformed data will still be in the Working Paper but would not be included in the SAR.

For the bullet dealing with discards, no data are available on discards other than that they were Atlantic Wolffish. Observer data would be needed in order to indicate the proportion of discards instead of proportion of landings. Also, it is not known how much is observed in different fisheries because there is very little observer coverage. In Scallop and Lobster fisheries, discards of Atlantic Wolffish are recorded. The landings data do not show all of the Atlantic Wolffish that have been handled and, therefore, does not account for discards. Data are limited on discards, but discards are recorded on the fisheries that are observed by at-sea observers. More work (data and analysis) is needed. Discard data could give Management Sectors more information for managing Atlantic Wolffish. Current poor levels of at-sea observer data make it difficult to determine true bycatch landings and whether these landings pose a significant risk to the population.

A tagging program on Wolffish showed that 63% of Atlantic Wolffish that were caught survived. This number would vary depending on the fishery because discards from some gears such as Scallop dredge and longline have lower survival rates. This was suggested as something that should be highlighted as a gap and stated in the uncertainties section of the SAR.

Since Atlantic Wolffish is a species of Special Concern, reference to habitat was changed from "critical" to "important" habitat. Abundance data were not available for the entire area especially in the inshore areas not covered by RV surveys. It is known that suitable habitats for Atlantic Wolffish are present in the inshore areas. Inshore surveys would be useful but there are not enough data. The summary bullet on discards was removed from the SAR but kept in the Working Paper.

Rewording of the summary bullet about the estimates of abundance and biomass from the summer RV surveys was done to reflect that it only dealt with data from RV surveys and not from all data sources. The other surveys only looked at distribution. The RV surveys in the last 10 years minus 2021 and 2018 is not a long time series with low numbers of Atlantic Wolffish. Before the last 10 years, the RV survey summer index appears to be good for looking at population trends. The data on other species from other surveys also show declines. While the decline appears to be real, there is variability in the estimates, and it may be necessary to look

at a longer time-span to capture this properly. It is unclear if the decline is due to missing data or whether there is uncertainty due to the lack of data. The data in the last few years in the time series have been a little more variable and uncertain, but this is not the case in the whole time series. Given the data sources that are available, abundance of Atlantic Wolffish remains low. It was agreed that statements on the conversion factor should be removed from the SAR.

METHODS

Under this heading in the SAR, discussion started out on the whether there are data to support any statements on changes to size-at-maturity. Such data are not collected during the RV surveys, and it was suggested that a comment about size-at-maturity be placed in the section on uncertainties. Biomass and abundance estimates are only from the RV survey, the Industry survey gives catch estimates with no estimates of biomass and abundance. Catch effort and catch/tow data are also not stratified. The 2020 RV survey was successfully completed so these data are included in the SAR without the 2018 and 2021 data.

It was agreed that in Table 1, the column on the percent occurrence should be removed from the SAR but the rest of the table would be retained.

ASSESSMENT

Under this section, it was suggested that a reference for mature/immature fish size be included. Suggestions were made to modify figures to make them clearer.

Since the data analyses were only on the Canadian section of Georges Bank, the corresponding figure should show only the data in 5Z1 and 5Z2. For the Industry surveys, a description of the data and the surveys would be useful.

Commercial Fishing Landings and at-sea observations

There is no evidence of new management measures being implemented and a discussion about discards would be more appropriate. Since April 2020, industry is supposed to retain discards. Data from SARA logs are not useful to determine if these fisheries are impacting Atlantic Wolffish; only the observer data are useful. When looking at landings data versus percent catch there are indications that discarding is occurring. Observer coverage is less than 15% and the landings are greater than what is caught; therefore, this indicates that there are discards. The figures on discards show that less wolffish are landed than caught. A table should be added to show these data in the Working Paper. The data shown in the discard figures are not sufficient to make any strong conclusions. It was suggested that last figure on discards be removed from the SAR because it does not provide information on how the fisheries interact with Atlantic Wolffish.

REFERENCES CITED

Simon, J., S. Rowe, and A. Cook. 2012. [Pre-COSEWIC Review of Atlantic Wolffish \(*Anarhichas lupus*\), Northern wolffish \(*A. denticulatus*\), and Spotted Wolffish \(*A. minor*\) in the Maritimes Region](#). DFO. Can. Sci. Advis. Sec. Res. Doc. 2011/088: vi + 73 p.

APPENDIX A: TERMS OF REFERENCE

Assessment of Atlantic Wolffish population trends in the Maritimes Region

Regional Science Peer Review Process – Maritimes Region

February 9–10, 2022

Virtual Meeting

Co-Chairs: Leslie Nasmith and Rabindra Singh

Context

Atlantic Wolffish (*Anarhichas lupus*) (listed as a species of Special Concern under the *Species At Risk Act* [SARA]) underwent steep declines in both abundance and area of occupancy over much of its range from the 1980s until the mid-1990s. Research Vessel (RV) surveys (NAFO areas 4X & 4VW) suggest that abundance continued to decline on the Scotian Shelf in the 2000s and remains at low levels (Simon et al. 2012). However, numerous factors make it difficult to confidently assess trends within the population. These include the historically low distribution and abundance of the species on the Scotian Shelf compared to Newfoundland and Labrador, life history traits (e.g., habitat preference/hyperdepletion), shifting environmental conditions, and variables within the RV survey itself (e.g., gear type/catchability, survey area).

Given the data sources available (e.g., Fisheries Observer data, SARA logbooks, other Fisheries and Oceans [DFO] surveys, industry data), is it possible to develop a reliable biomass index for the Scotian Shelf portion of the population? Can the index be used to understand population trends over time, and to assess and track fishing mortality over time? What does the data reveal about species distribution patterns, potential drivers of population decline, range shifts, and/or sustained low abundances?

Objectives

The specific objectives of this Regional Science Peer Review Process are to:

- Develop a biomass index for the Scotian Shelf portion of the population;
- Examine population trends over time;
- Examine distribution patterns over time;
- Estimate mortality due to fishing over time.

Expected Publications

- Science Advisory Report
- Research Document
- Proceedings

Participation

- DFO Science
- DFO Fisheries Management
- DFO Species at Risk Program
- Fishing industry
- Provincial representatives
- Indigenous Communities / Organizations
- NGOs

References

Simon, J., S. Rowe, and A. Cook. 2012. [Pre-COSEWIC Review of Atlantic Wolffish \(*Anarhichas lupus*\), Northern wolffish \(*A. denticulatus*\), and Spotted Wolffish \(*A. minor*\) in the Maritimes Region](#). DFO. Can. Sci. Advis. Sec. Res. Doc. 2011/088: vi + 73 p.

APPENDIX B: LIST OF PARTICIPANTS

Participants at the Maritimes Regional peer-review meeting on the Assessment of Atlantic Wolffish population trends in the Maritimes Region, February 9–10, 2022.

Name	Affiliation
Elizabetha Tsitrin (Lead)	DFO Science, Maritimes Region
Kayla Silver	DFO Science, Maritimes Region
Daphne Themelis	DFO Science, Maritimes Region
Leslie Nasmith (Co-chair)	DFO Science, Maritimes Region
Rabindra Singh (Co-chair)	DFO Science, Maritimes Region
Donald Clark	DFO Science, Maritimes Region
Claire Mussells (Reviewer)	DFO Science, Maritimes Region
Catriona Regnier-McKellar (Reviewer)	DFO Science, Maritimes Region
Tania Davignon-Burton	DFO Science, Maritimes Region
Una Goggin	DFO Science, Maritimes Region
Adam Mugridge	Nova Scotia Fisheries and Aquaculture
Paige Crowell	DFO Species at Risk Program, Maritimes Region
Koren Spence	DFO Resource Management, Maritimes Region
Penny Doherty	DFO Resource Management, Maritimes Region
Luiz G.S. Mello	DFO Science, Newfoundland and Labrador Region
Candace Nickerson	DFO Resource Management, Maritimes Region
Jarrad Sitland	DFO Resource Management, Maritimes Region
Kathryn Cooper-MacDonald	DFO Resource Management, Maritimes Region
Kris Vascotto	Groundfish Enterprise Allocation Council
Katie Schleit	Oceans North
Aruna Jayawardane	Maliseet Nation Conservation Council

APPENDIX C: AGENDA

Maritimes Regional peer-review meeting on the Assessment of Atlantic Wolffish population trends in the Maritimes Region

9–10 February, 2022
Virtual Meeting (MS Teams)

Day 1: Wednesday, February 9, 2022

Time	Topic	Leads
1:00 – 1:10	Introduction	Co-Chairs: L. Nasmith and R. Singh
1:10 – 2:00	Presentation: Assessment of Atlantic Wolffish: Population trends on the Scotian Shelf	L. Tsitrin and K. Silver
2:00 – 4:00	Reviewers' comments and Discussion	Reviewers and Everyone

Day 2: Thursday, February 10, 2022

Time	Topic	Leads
9:00 – 9:10	Review of day 1, agenda for day 2	Co-Chairs: L. Nasmith and R. Singh
9:10 – 12:00	Review of draft SAR	Everyone
12:00 – 1:00	Lunch	
1:00 – 4:00	Review of draft SAR (continued)	Everyone