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Newfoundland and Labrador Region

Proceedings of the Regional Peer Review of the 3Ps Witch Flounder Stock Assessment, and the 3LNO Haddock Stock Assessment

Meeting dates: December 4–5, 2017
Location: St. John's, NL

Chairperson: Brian Healey
Editor: Flora Salvo

Science Branch
Fisheries and Oceans Canada
PO Box 5667
St. John's, NL A1C 5X1

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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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Aussi disponible en français :

MPO. 2022. Compte rendu de l'examen régional par les pairs de l'évaluation des stocks de plie grise dans la sous-division 3Ps et d'aiglefin dans les divisions 3LNO; du 4 au 5 décembre 2017. Secr. can. des avis sci. du MPO. Compte rendu 2022/022.

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SUMMARY

The Regional Peer Review Processes on the status of 3Ps Witch Flounder and 3LNO Haddock were held December 4–5, 2017, in St. John's, Newfoundland and Labrador (NL). The purpose was to assess the stock status of Witch Flounder in Northwest Atlantic Fisheries Organization (NAFO) Subdivision (Subdiv.) 3Ps, and Haddock in NAFO Divisions (Divs.) 3LNO.

In addition to these Proceedings, publications to be produced from the meeting include a Science Advisory Report and a Research Document for each species, all of which will be make available online through the Canadian Science Advisory Secretariat (CSAS).

ECOSYSTEM OVERVIEW 3LNO

Presenter: Brian Healey, DFO NL Science (on behalf of Mariano Koen-Alonso, DFO NL Science)

ABSTRACT

Not provided.

DISCUSSION

No questions were asked by participants.

OCEANOGRAPHIC OVERVIEW SUBDIV. 3PS AND DIVS. 3LNO

Presenter: Gary Maillet, DFO NL Science - Oceanography

ABSTRACT

Oceanographic data from NAFO Divs. 3LNOPs during the spring of 2017 were examined and compared to previous years and the long-term average. Sea surface temperatures across the region decreased over the previous year and were below normal during spring and early summer of 2017. In 2017, bottom temperatures decreased over 2016 values to slightly above normal in 3Ps and about normal in 3LNO. Bottom temperatures in deeper water of the Laurentian Channel show positive (up to +4°C) anomalies with temperature values up to 9°C in some areas. Deeper slope waters on southeastern St. Pierre Bank were also exceptionally warm during the past four years with values reaching 8–12°C.

The extent of >4°C water covering the bottom of 3Ps in 2017 was about normal, at about 40% of the total bottom area. In 3LNO, the extent of the bottom area covered by water with temperatures >3°C was also about normal at about 15%, a significant decrease over the peak value observed in 2011. In both regions there has been an increasing trend in the amount of warm slope water since about 1990.

Overall, there appears to have been important changes in general patterns of productivity of lower trophic levels in recent years. Satellite remote sensing data indicates a reduction in both magnitude and amplitude of the spring bloom in 3Ps and across the Grand Banks during 2015–17. The peak timing of the spring bloom has occurred later by up to two weeks from 2014–17 while the duration has been on the decline in some areas of the Grand Banks.

The trend in zooplankton biomass has been in decline in 3Ps since 2013, showing a substantial reduction (~50%) from peak levels compared to 2017. The preliminary biomass data from spring 2017 shows a slight recovery over the 2014–16 values but remain at a low level. Along the standard Atlantic Zone Monitoring Program (AZMP) sections across the Grand Banks the biomass of marine copepods also show a decline since 2007 while macro-zooplankton show a downward trend beginning in 2012. The large reduction in zooplankton biomass in recent years may influence transfer of energy to higher trophic levels in the ecosystem.

DISCUSSION

A discussion occurred concerning the oceanographic overview presented and potential effects on Haddock and Witch Flounder stocks. There is an increase in regional temperature of 3–4°C depending on region and a change in the quantity (lower) and quality (diversity) of the zooplankton community.

More specifically, the replacement in the dominance pattern of *Calanus* sp. by *Pseudocalanus* sp. (less lipids) changes the energy available for fish larvae and pre-recruits in the system. However, contrary to Atlantic Cod larvae which depend heavily on *Calanus* to grow, Haddock can feed on a broader range of prey. Caution should be taken when interpreting juvenile needs according to species.

DIVS. 3LNO HADDOCK

Presenter: Danny Ings, DFO NL Science

ABSTRACT

The Haddock fishery began in the late-1940s with landings peaking at 76,000 t in 1961. From 1973 to 1992, landings averaged 2,378 t annually. This stock has been under moratorium since 1993. From 1993 to 2015, landings averaged 146 t annually but reported landings increased to 371 t in 2016.

Both the spring and fall research vessel (RV) survey indices have varied without trend since the mid-1990s. The distribution of Haddock differs between the spring and fall surveys as they are concentrated in the slope waters during spring but occur at variable locations along the slopes and on the bank in autumn, where waters tend to be warmest. Recruitment is episodic in this stock and a recruitment index based on fish less than 20 cm in the fall RV surveys was lower in 2015 than the 1995–2016 average. No fish less than 20 cm were caught on 2016 or 2017 RV surveys.

Results of an annual (late-spring) bottom trawl survey conducted by Spain outside of Canada's 200 nautical mile Exclusive Economic Zone (EEZ) indicated low biomass values in 2017 relative to peak values during 2011 to 2013. However, this survey covers only a small portion of the stock area.

Several candidate limit reference points (LRPs) based on proxies of B_{MSY} derived from survey indices of total biomass were considered. However, none were deemed sufficiently reliable/plausible to accept.

This stock is not currently on a defined management schedule and updates on stock status are not provided on an interim basis. While potential triggers for interim year assessments were considered, none were accepted and it was concluded that given the variability and lack of trend in the time series, this stock should be assessed regularly, on a three to five year rotation.

In the absence of a model of population dynamics and the lack of trend in the survey indices, advice could not be provided on whether to maintain a moratorium on fishing.

DISCUSSION

Review of commercial data and survey data

Research vessel survey data, biomass index, recruits and landings were reported. There were uncertainties regarding data obtained from Spain concerning landings in 2016 and 2017 that appeared abnormally high outside Divs. 3LNO. These data need further clarification. It was noted that the Canadian multi-species survey biomass values from 1996–2016 were low compared to previous records (dating to 1976). However, it was explained that data between fishing gear are not comparable and there is no conversion factor available to convert data prior to 1996.

Landings and biomass surveys were agreed to be good indicators for Haddock.

Participants discussed that abundances were low and that there was no pattern for cohorts after growing to >45 cm. It was suggested that larger Haddock may migrate out of 3LNO. Participants agreed that recruitment appeared episodic, and it was highlighted that no recruitment was reported in spring 2015–16.

A discussion on the sampling method highlighted the importance of using the same gear, timeframe, and number of sets for surveys.

Maps representing Haddock abundance in comparison to temperature fluctuations were presented and trends were detected. It was agreed that the relationship between Haddock and temperature should be further explored.

Proxy reference points and triggers

It was noted that the stock has high variability and recruitment is episodic. The present stock is low compared to historical data. Participants discussed how traditional indices are difficult to use for Haddock.

Multiple approaches were proposed to define a reference point (i.e., B_{MSY}). Participants discussed whether it was appropriate to use only Campelen data (starting in 1996) and not the full-time series (1976–2016). It was decided that the full-time series could not be used due to the absence of a conversion ratio between fishing gears.

There was also a discussion about whether to use spring and/or fall survey data. There were concerns about using spring data due to the variable timing of fish migration, and participants raised questions about the distribution of fall survey data. Participants further discussed how inferences based on the data need to consider both the history of the stock (high landings in the 1970s) and the evolution of moratorium (i.e., change from non-targeted to targeted species).

Although several candidate LRPs based on proxies of B_{MSY} derived from survey indices of total biomass were considered, participants agreed not to accept proxy reference points. Participants also agreed that triggers for interim year assessments could not be accepted at this time.

RESEARCH RECOMMENDATIONS - HADDOCK

- Explore trends in distribution (including oceanography data) with strata and temperature.
- Further investigate a conversion ratio with the aim to develop a longer time series.
- Investigate aging of Haddock.

SUBDIV. 3PS WITCH FLOUNDER

Presenter: Laura Wheeland, DFO NL Science

ABSTRACT

The Witch Flounder fishery in NAFO Subdiv. 3Ps consists primarily of inshore Danish seine and offshore otter trawl fisheries, with total annual landings fluctuating between 200 and 600 t from the mid-1990s to present; landings from 2014–16 averaged 472 t. The annual Total Allowable Catch (TAC) has been stable at 650 t since 1998. The fishery primarily harvests fish 30–50 cm in length, with a peak near 40 cm.

Indices of both abundance and biomass from the spring RV survey have varied without trend throughout the time series. Indices increased in 2016 and 2017 to values at or among the highest in the time series; however, each of these indices is highly influenced by a single large

survey tow resulting in high uncertainty. Pre-recruit (16–30 cm) abundance has varied without trend in this stock since 1996, and no clear stock-recruit relationship has been identified. Length composition from the RV survey is primarily composed of fish 20–40 cm. An increase in the mode of the length frequency has been observed since around 2011.

A LRP was accepted based on a proxy of B_{MSY} calculated as the geometric mean of survey biomass indices from 1983-93, with values adjusted to account for increased survey coverage inshore after 1996. Consequently, an interim LRP was accepted at 40% B_{MSY}.

The stock is currently above the LRP, and has been in most years of the time series (1983–2017). This stability indicates the stock was able to sustain the range of harvest rates over this time period.

This stock is not currently on a defined assessment schedule and updates on stock status are not provided on an interim basis. The current meeting recommended that the stock be placed on a regular schedule of assessment, with four years suggested as an appropriate interval. Triggers for interim year assessments were considered, but none were accepted.

DISCUSSION

Review of commercial data and survey data

Participants discussed the most recent two points of the time series (i.e., high values) and their uncertainty. It was explained that the higher indices within these surveys were driven by a single set each year. Participants also discussed size at maturity from the survey through the time series (and in particular 2017).

It was clarified for participants that survey data available for Witch Flounder dates to 1972 (when fisheries on this stock were high), and that no conversion factors are available for gear used in the RV survey prior to 1984.

Participants discussed the reliability of comparing data from 1983–93 and post-1993, as the surveys biomass indices started to decline in 1994. This reduction of the measured biomass was debated and participants made several hypothesis:

- A shift in survey timing occurred in 1993. Fish may be more highly aggregated later in the spring, forming pre-spawning and spawning aggregations in the latter;
- Differences in environmental factors such as temperature, or migration during the spring period may impact movement of the stock in the latter sampling period;
- It is a natural decline of the population; or
- Population had difficulties to recover from earlier fisheries.

The participants also analyzed a comparison of maps representing fish distribution in 1993 when the RV survey occurred in the winter and in the late-spring. The season comparison was inconclusive as only a single year’s data is available.

Participants discussed age composition of the stock; however, no aging data are available since 1994, therefore recent growth patterns and age structure are unavailable

The timing of the spring RV survey (late-April to mid-May) are mostly similar between years after 1993. There was no trend identified between survey indices and sampling date.

Seasonality was also discussed by participants. It was noted that Witch Flounder are landed from both targeted fisheries and as bycatch, with targeted species differing seasonally and

yearly based on factors that include species behavior (e.g., aggregation, migration, reproduction) and environmental conditions.

The impact of single large tows in each of the last two years of the survey, and the resulting high levels of uncertainty in biomass and abundance indices were discussed. These large sets were dominated by fish in or near spawning condition. It was noted that high uncertainties in indices for this stock have been previously observed (1984, 1990, 1992, 2007). A recalculation of survey indices after the removal of the two sets driving the high values and uncertainty was examined to investigate their influence on survey indices, but this was not considered to be a valid representation of the data or stock status. It was noted by participants that this may need further investigation in future years if the trend persists.

Participants concluded that there was no specific trend observed since 1993 in the landings and survey indices except for the recent increase in biomass and abundance during 2016–17. Discussion also occurred on whether or not to integrate data since 1983 because of changes in sampling time (i.e., winter to spring). A participant suggested that given recent catches (since 1994) are relatively low, there has been no trend in indices of biomass and abundance in that period, and that there is no knowledge of q (catchability), that either the population is at carrying capacity or the catch rate is too high for the stock to recover.

Proxy reference points

Participants thoroughly discussed different scenarios concerning a LRP based on a proxy of B_{MSY} estimated from survey indices. Participants considered the impact of survey timing on index values and comparability of current surveys to pre-1993 values, as well as the long-term trend observed in landings and survey indices. An interim LRP was accepted by participants (40% of the geometric mean of biomass indices from 1983 to 1993). Triggers for assessments in interim years were also heavily discussed. A trigger for this stock would need to represent a sustained change, but given the high inter-annual variation and uncertainties on survey indices the meeting was unable to recommend appropriate triggers. Future consideration of triggers should be based on biomass relative to the LRP. It was recommended that this stock be put on a defined assessment schedule, with an assessment scheduled for every four years.

MODELLING: BAYESIAN SURPLUS PRODUCTION MODELS

Presenter: Joanne Morgan, DFO NL Science

Preliminary Bayesian surplus production models were explored using catch data from 1960-2016 and survey data from 1983–2016. Two different model formulations were examined:

- Run 1: same model structure as 3NO Witch;
- Run 2: same as 3NO Witch but with prior on q, and observation error as 3Ps Plaice.

The two model formulations gave very different estimates of survey catchability resulting in differing population biomass levels. There may not be enough relationship between catch and stock biomass to allow this type of modelling to be successful. It was explained that this will need to be explored further.

Participants agreed that the model exploration exercise was promising and that model assumptions need to be further investigated.

RESEARCH RECOMMENDATIONS - WITCH FLOUNDER

- Continue the exploration of the Bayesian surplus production model.

- Update aging data for this stock (not aged since 1994), facilitating the examination of potential changes in population age-structure, growth rates, and age at maturity.

REFERENCES CITED

DFO. 2014a. Stock Assessment of NAFO Divisions 3LNO Haddock. DFO Can. Sci. Advis. Sec., Sci. Advis. Rep. 2014/043

DFO. 2014b. Stock Assessment of NAFO Subdivision 3Ps Witch Flounder. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/077.

APPENDIX I: TERMS OF REFERENCE: 3PS WITCH FLOUNDER STOCK ASSESSMENT

Regional Peer Review – Newfoundland and Labrador Region

December 4–5, 2017 St. John's, NL

Chairperson: Brian Healey

Context

The status of the Witch Flounder stock in Northwest Atlantic Fisheries Organization (NAFO) Subdivision 3Ps was last assessed in 2013. The current assessment is requested by Fisheries Management to inform the development of management measures for the stock for the upcoming fishing season(s).

Objectives

- Provide an ecosystem overview (e.g., physical and biological oceanography, predators, prey) for the stock.
- Report on commercial fishery statistics (overall landing distribution, breakdown by fishing gear) and biological data resulting from the commercial sampling program (size structure).
- Analyze historical data from the research surveys up to 2017 (abundance index, biomass, recruitment, size structure and geographical distribution of catches).
- Identify biomass and/or fishing mortality Limit Reference Points (or appropriate proxies).
- Identify indicators that should be evaluated during the years without a formal stock assessment.
- Evaluate the impact of maintaining and increasing current harvest levels.

Expected Publications

- Science Advisory Report
- Research Document
- Proceedings

Expected Participation

- Fisheries and Oceans Canada (DFO) (Science, Fisheries Management)
- Provincial Department of Fisheries and Land Resources
- French Research Institute for Exploitation of the Sea (IFREMER)
- Academia
- Indigenous groups
- Fishing Industry
- Non-governmental organizations

References

DFO. 2014. Stock Assessment of NAFO Subdivision 3Ps Witch Flounder. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/077.

APPENDIX II: TERMS OF REFERENCE: 3LNO HADDOCK STOCK ASSESSMENT

Regional Peer Review – Newfoundland and Labrador Region

December 4–5, 2017 St. John's, NL

Chairperson: Brian Healey

Context

The status of the Haddock stock in Northwest Atlantic Fisheries Organization (NAFO) Divisions 3LNO was last assessed in 2014. The current assessment is requested by Fisheries Management to inform the development of management measures for the stock for the upcoming fishing season(s).

Objectives

- Provide an ecosystem overview (e.g., physical and biological oceanography, predators, prey) for the stock.
- Report on commercial fishery statistics (overall landing distribution, breakdown by fishing gear) and biological data resulting from the commercial sampling program (size structure).
- Analyze historical data from the research surveys up to 2017 (abundance index, biomass, recruitment, size structure and geographical distribution of catches).
- Identify biomass and/or fishing mortality Limit Reference Points (or appropriate proxies).
- Identify indicators that should be evaluated during the years without a formal stock assessment.
- Evaluate the impact of maintaining and increasing current harvest levels.

Expected Publications

- Science Advisory Report
- Research Document
- Proceedings

Expected Participation

- Fisheries and Oceans Canada (DFO) (Science, Fisheries Management)
- Provincial Department of Fisheries and Land Resources
- Academia
- Indigenous groups
- Fishing Industry
- Non-governmental organizations

References

DFO. 2014. Stock Assessment on Subdivision 3Ps Haddock (*Melanogrammus aeglefinus*). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2014/044

APPENDIX III: AGENDA

Regional Peer Review – 3LNO Haddock and 3Ps Witch Flounder Stock Assessments

Chair: Brian Healey

December 4–5, 2017

Memorial Room, Northwest Atlantic Fisheries Centre

Monday, December 4, 2017

Time	Topic	Presenter
09:00	Opening remarks and overview of Regional Peer Review Process	B. Healey
-	Ecosystem Overview	B. Healey
-	Oceanographic Overview	G. Maillet
-	3LNO Haddock • Review of commercial data • Review of survey data • Proxy reference points • Drafting of summary bullets for Science Advisory Report	D. Ings
12:00	LUNCH	-
13:00	3Ps Witch Flounder • Review of commercial data • Review of survey data • Proxy reference points • Drafting of summary bullets for Science Advisory Report	L. Wheeland

Tuesday, December 5, 2017

Time	Topic	Presenter
09:00	Conclusions and Research Recommendations	All participants
-	Upgrading of Working Paper to Research Document	All participants
-	Closing remarks	All participants

Notes:

Health breaks will occur at 10:30 a.m. and 2:30 p.m.

Lunch (not provided) will normally occur 12:00-1:00 p.m.

Agenda remains fluid and may change.

APPENDIX IV: LIST OF PARTICIPANTS

Name	Affiliation
David Coffin	DFO NL – Resource Management
Flora Salvo	Rapporteur
Roland Hedderson	Fish, Food and Allied Workers Union
Miranda McGrath	Fish, Food and Allied Workers Union
Chelsey Karbowski	Ecology Action Centre
Karen Dwyer	DFO NL – Science
Erika Parrill	DFO NL – Centre for Science Advice
Rick Rideout	DFO NL – Science
Brian Healey	Meeting Chair
Danny Ings	DFO NL – Science
Laura Wheeland	DFO NL – Science
Shelley Dwyer	Department of Fisheries and Land Resources
Kris Vascotto	Groundfish Enterprise Allocation Council
Eugene Colbourne	DFO NL – Science
Gary Maillet	DFO NL – Science
Bob Rogers	DFO NL – Science
Julie Diamond	DFO NL – Resource Management
Joanne Morgan	DFO NL – Science