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Proceedings of the Regional Peer Review of the 2J + 3KL Witch Flounder Stock Assessment

May 9, 2018
St. John's, NL

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Editor: Emma Cooke

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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.

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SUMMARY

A Regional Peer Review Process for the assessment of Witch Flounder in Newfoundland and Labrador (NL) was held on May 9, 2018 in St. John's, NL. The purpose of this meeting was to provide the most recent information concerning the status of Witch Flounder (*Glyptocephalus cynoglossus)* stocks in Northwest Atlantic Fisheries Organization (NAFO) Divisions 2J3KL in Newfoundland.

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

INTRODUCTION

The Regional Peer Review Process on the status of Witch Flounder was held on May 9, 2018, in St. John's, Newfoundland and Labrador (NL). The purpose of this meeting was to provide the most recent information concerning the status of the Witch Flounder (*Glyptocephalus cynoglossus)* stock in Northwest Atlantic Fisheries Organization (NAFO) Divisions (Divs.) 2J3KL.

The meeting included participants from Fisheries and Oceans Canada (DFO) Science and Fisheries Management Branches (Newfoundland and Labrador Region), the Provincial Department of Fisheries and Land Resources, NunatuKavut Community Council, fishing industry representatives, and Memorial University.

The proceedings include abstracts and summaries of the discussion for the presentations. Additional information can be found in the Science Advisory Report and Research Document or from references cited therein.

PRESENTATIONS: ABSTRACTS AND DISCUSSIONS

OCEANOGRAPHIC AND ECOSYSTEM TRENDS IN THE NORTHWEST ATLANTIC

Presenter: Laura Wheeland

Abstract

Ocean temperatures and a standardized climate index reach record highs around 2010-11, before trending downward to 2017. Seasonal surveys across Divs. 2J3KL indicate reduction in inventories of macronutrients in 2017 and recent years, coinciding with a reduction in phyto- and zooplankton biomass during the same time period. Changes observed in lower trophic levels and community composition of zooplankton indicate reduced primary and secondary inputs that may impact transfer of energy to higher trophic levels in recent years. During 2004-10 there was an increasing trend in the finfish biomass in Divs. 2J3KL; with many components of the community showing positive signals. Total finfish biomass remained fairly stable during the early-2010s at levels still well below pre-collapse levels, but showed signals of decline by 2013-14 that have continued to the present. This recent decline (since 2014) may be linked to decreases in prey availability (e.g. shrimp, capelin) as well as other changes in ecosystem conditions which indicate reduced ecosystem productivity.

Discussion

There was no discussion amongst participants.

HABITAT ASSOCIATIONS OF WITCH FLOUNDER

Presenter: Bob Rogers

Abstract

Habitat associations of 2J3KL Witch Flounder were investigated using abundance data from stratified surveys to develop cumulative distribution functions of fish abundance in relation to depth and temperature. When examining habitat covariates independently, Witch Flounder were found to preferentially associate with temperatures 3-4 °C and depths from 300-700 m,

disproportionately deeper and warmer than what was available. Most significant depth associations were actually being driven by temperature associations.

Discussion

A participant asked if the change in spatial distribution of Witch Flounder in the 1980s, and in recent years, was driven by changes in water temperature. Participants discussed that water temperature changes are a component; however, movement of Witch Flounder may also be influenced by fishing pressure. Examining the influence of water temperature on spatial distribution of Witch Flounder over time was identified as a research recommendation. Further, examining the distribution of Witch Flounder of different length classes would be a valuable research component.

The possibility of Witch Flounder exhibiting seasonal preferences for habitat was discussed. A participant noted that seasonal distributions may be driven by changes in water temperature, and the timing of the research vessel (RV) survey may cause the distribution and abundance data to be truncated. The presenter responded that these data were based on the fall RV survey. For the spring RV Survey there is only data for Div. 3L, which is relatively cold, compared to Divs. 2J and 3K. Comparing distributions from the fall and spring RV surveys may give spurious results because of these temperature differences across the region.

WITCH FLOUNDER STOCK ASSESSMENT

Presenter: Laura Wheeland

Abstract

The Witch Flounder stock in NAFO Divs. 2J3KL has been under moratorium in Canadian waters since 1995, and in the NAFO regulatory area since 1998. Current landings from bycatch average 174 t annually, with the majority of the landings coming from the Canadian Greenland Halibut fishery along the shelf edge. Commercial catch sampling for this stock has inconsistent coverage, but suggests landings of this species from bycatch in otter trawls is primarily fish between 30-60 cm.

The DFO RV survey occurs annually in Divs. 2J3KL in the fall, with the Campelen equivalent data series available for this stock since 1983. Survey coverage has varied through the time series, with inconsistent coverage of inshore and deep strata, introducing uncertainty into survey indices. A lack of inshore coverage is considered to have had a greater impact of survey abundance estimation, as inshore strata may hold large numbers of small fish. Whereas uncertainty in biomass indices is more impacted to coverage of the deep strata, as the proportion of survey biomass in these strata varied through the time series; proportion of biomass in the deep strata was greatest when the stock was at low levels.

Witch Flounder catches from the RV survey suggest a recent expansion in the distribution of this stock, corresponding to increases in indices of abundance and biomass since 2003, to the highest levels observed since 1991. These increases follow a rapid decline in stock size and constriction of distribution to the shelf edge through much of the 1980s and early-1990s. Length composition and indices of pre-recruit abundance suggest improved recruitment in this stock since 2013.

Discussion

Catch in 2J3KL

A graph showing fishing bycatch by country was displayed. A participant noted that there are a number of years where Canadian bycatch was low; however, bycatch subsequently increased in 2010. The participant asked whether there were changes in the timing of the fishery or fish distribution. The response was that the redfish fishery opened around 2010 in addition to a temporal shift in fishing. A combination of these two factors may have influenced the level of bycatch by Canadian fisheries.

Research Vessel (RV) Survey

There has been inconsistent strata coverage in the RV survey, particularly in inshore and deep strata. A participant asked whether these strata are still included in the RV survey, and when the level of coverage changed. The response was that coverage in the deep portion of Div. 3L was covered consistently through 2003, however this region was only covered in three of the last 10 years of the RV survey (2009, 2010, 2014). Also, the inshore region has not been covered in many years and there is no allocation in the current survey plan to survey the inshore area.

A participant expressed concern that historically there was an inshore component to the Witch Flounder fishery, before the inshore component of the RV survey began. Further, inshore survey coverage only continued until 2006, thus any effect of the inshore region on the analysis of distribution may not be seen. The response was that although there are Witch Flounder within the inshore region, there are gear conflicts with the inshore fishery as well as time constraints for the survey, and therefore distribution within the inshore cannot be inferred.

A research recommendation was identified to examine the link between inshore Witch Flounder larval abundance with stock status and recruitment. There was concern that the link should be examined using pre-recruit abundance. The response was that although it would be highly beneficial to use pre-recruit data from the inshore region, only larval data is currently available. By analyzing pre-existing larval data, gaps within survey coverage with respect to pre-recruit abundance may be identified. The presenter also displayed a graph of pre-recruits without the inshore data to adjust for years with missing inshore coverage, allowing for consistency in between-year comparisons. This graph showed supported the relative strength of pre-recruit indices in recent years.

It appears that the abundance of Witch Flounder in deep water and the inshore may differ depending on population size. It was noted that when the population was at low levels, distribution was primarily in the deep water, with few fish on the shelf. However, with recent increases in population size, a greater abundance is being observed in these shelf areas.

A participant asked if one can look at stock status within separate divisions. The response was that the distribution is changing, especially within Div. 3L, which complicates comparisons among divisions.

A participant was concerned about the range of the error bars for the abundance index. Participants discussed that the error bars scale with the mean, and some years there is higher variation. It was highlighted that the focus should be on the mean values and that the variance is likely consistent over time.

A participant observed that the data for the inshore strata only displayed biomass, not abundance, and asked whether the abundance data was different. The response was that the data are available and the abundance data were skewed by fish length.

There was discussion on whether the recent increase in year-class strength will cause an increase in population size in 2018. There was agreement that the population may increase; however, it is always possible that year-classes disappear without warning. Additionally, the recent increase in recruitment is likely only resulting from a single year-class.

REFERENCE POINTS

Presenter: Laura Wheeland

Abstract

A Limit Reference Point (LRP) for Witch Flounder in NAFO Divs. 2J3KL was adopted. The current NAFO LRP was presented for context. No analytical model is available for this stock; therefore a survey-based reference point was used. The impact of varying levels of survey coverage – in particular in 3L deep (>730 m) – was discussed to determine if a conversion to the survey indices or LRP would be required to account for differences in coverage. While the exact magnitude of the impact of missed survey strata cannot be determined, the meeting agreed that these are not likely to impact stock status relative to the LRP; therefore a conversion was not applied. A proxy for B_{MSY} was accepted as the mean of the survey biomass indices from the 1983-84 fall RV surveys. Consistent with the DFO decision-making framework incorporating the precautionary approach, a LRP of 40% B_{MSY} was adopted.

Discussion

A participant clarified that the NAFO LRP is based on B_{lim} of 30% B_{MSY}, while in Canada the LRP is based on B_{lim} of 40% B_{MSY}. There was a question on why biomass in 1984 became the basis for B_0. Another participant recollected that this LRP was provided based on the best available information at the time, and 15% was chosen as an initial LRP. In 2011 there was a discussion to adjust the reference and survey points; however there have been complications due to limited survey coverage in recent years. The participants discussed focusing on a B_{MSY} proxy instead of B_0.

Based on the information presented, it appears that the 1983-84 period represents a reasonable proxy for $B_{MSY,}$ and not B_0. Given the Canadian Precautionary Approach (PA) Framework, a LRP at 40% B_{MSY} was proposed. A participant asked why the 1983-84 time period was chosen as the reference period. The response was that based on the best information available, the 1983-84 period was a time at which survey indices indicate a relatively high, and stable, population size, coinciding with a period when the population experienced a range of fishing effort. Division-specific indices of biomass allowed a look into years prior to the start of the combined 2J3KL survey index (1983) for Divs. 2J (1977) and 3K (1978). These indicated a period of relatively stable high biomass in both of these divisions from the start of these time series through the early 1980s. The presenter noted that the only possible way to use a longer time-series would be to only assess data from a single division, which is not a viable option. There was discussion to create a longer time-series using a modeling approach in areas with sufficient survey coverage, which may be possible until 1977. Exploring modeling approaches for the Witch Flounder stock was identified as a research recommendation.

A participant noted that the stock was close to B_{MSY} in 1984 and asked why the stock collapsed so dramatically. The response was that the Witch Flounder stock collapse likely occurred for the same unclear reasons as the collapse of many other commercial fish stocks at that time (e.g. environmental changes, fishing pressure).

There was discussion around changes between historical and current levels of recruitment. There is no way to know how recruitment was influenced by high levels of productivity as only current information on productivity is available, and currently this is a period of low productivity. It is also difficult to assess juvenile abundance before 1995 because young fish were likely underrepresented as a result of gear selectivity.

A participant asked why positive signs of recruitment are not being seen. A participant responded that with respect to length at 50% maturity (L_{50}), there has been low productivity in many species and L_{50} has not changed significantly over time. As information is only assessed from 1996 onwards, and the stock may have declined since the 1980s, it is difficult to assess the changes in L_{50} and when the change in maturity occurred.

A participant asked how the LRP would be adjusted for the absence of deep water survey coverage in Div. 3L. It was suggested to look at biomass by depth, as in years when deeper waters were not sampled, there was higher fish biomass at greater depths. A participant also noted that seasonal movements may cause uncertainties; it was suggested that a comparison between fishery and survey data be completed for the overlapping time periods. However, fish biomass in deep water has not been substantial in recent years.

There is an increasing trend in the number of small fish within the stock; however, a participant asked how the changing survey coverage influences the index of recruitment. The response was that since the inshore is no longer being covered, recruitment is likely underestimated; however, the magnitude of this uncertainty is unknown. Nonetheless, the underestimation of small fish will not affect the LRP for the years when the inshore region was not surveyed. It was asked whether a ratio of small fish and total biomass should be created. In this stock there are limited age and maturity data which limits the value of this ratio.

Following the above discussions, participants agreed on a LRP at 40% of proxy for $B_{MSY,}$ with this proxy defined as the average survey biomass from 1983-84. It was agreed that no adjustment for survey coverage will be made to this biomass; however, caveats will be outlined in the CSAS SAR.

There was discussion on whether the harvest levels should be adjusted and it was concluded that there is not enough information to infer beyond the stock status and population trends.

INDICATORS AND PROCEDURE TO TRIGGER FULL ASSESSMENT DURING INTERIM YEARS

Presenter: Joanne Morgan

Abstract

Indicators must be based on data or model outputs available in the interim years for which an update is expected. The indicators must be able to be evaluated against the trigger values in the interim years. For this stock, there is one indicator - the autumn survey index. Total Biomass from the autumn DFO RV survey should be used as an interim year indicator of stock status. This index provides the basis for the assessment.

If a stock is in the critical zone and the interim-year update shows indicators with a significant directional change in stock trajectory from expected positive to observed negative, there is a high risk to sustainability. As such, for stocks in the critical zone declines are considered more important than any increase.

For assessments based on abundance or biomass index trends, if the main smoothed index has changed by more than X standard deviations (SD) from the expected value, given the sensitivity of the survey index, then this may warrant a re-assessment and revised advice (X is stock specific).

Smoothing of the survey index is suggested because the indicators should be characterized by sufficiently small inter-annual variation to allow the detection of variation of stock status. Options for handling inter-annual variation may include using smoothed values over a stock-appropriate number of years.

Three to five year windows for smoothing are commonly used. The smoothing window would depend on a number of factors including mean generation time, variability in the index and age at recruitment to the fishery. The more variable the index, the longer the smoothing window.

The 95% confidence intervals for the last fitted value of a smoother of the fall 2J3KL biomass index from 2002 to 2017 should serve as the trigger for a new assessment. In this approach, the interim year is year y. The average of the biomass index for y-2 to year y (in the first year from 2016 to 2018) will be compared to the 95% confidence interval for 2017 from the smoother. If this average falls outside of the 95% confidence interval a new assessment will be conducted.

Discussion

It was suggested that in the future, minimum survey coverage should be defined.

At this time it is not known with what frequency DFO Science will be requested to provide a full assessment of this stock. It was clarified that an assessment is not expected be completed for the next three years unless it was requested. However, if the next two years, the survey shows values above the LRP, then an assessment would likely be recommended by DFO Science.

A participant asked when the larger recruit node is expected to reach commercial size (i.e., 30 cm). The response was that it is possible that this recruitment pulse could reach 30 cm by 2018. However, the trigger is based on survey biomass, not length frequency. It was emphasized that this is an index-based assessment and B_{lim} will likely need to be surpassed for several years before the stock will be considered for reopening. There was discussion around using a sliding window average with a smoother to assess the relative future stock status.

DRAFTING OF SCIENCE ADVISORY REPORT

Discussion

Participants emphasized that the stock may be underestimated due to annual variation in survey coverage in 3L; however, not all of the uncertainty is attributed to lack of survey coverage. Regarding recruitment, participants were hesitant to assess cohort strength as aging information is not currently available.

It was highlighted that there is a high level of uncertainty in the assessment of the Witch Flounder stock. Participants discussed that the stock is certainly in the critical zone; however, precision and proximity to B_{lim} is unknown.

RESEARCH RECOMMENDATIONS

1. Work to 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. This will first require an age validation study for this stock.

2. Investigate population modeling approaches for this stock, including methods which incorporate variation in survey coverage.
3. Examine changes in stock distribution over the survey time series with respect to habitat (temperature, depth, etc.) and fishing.
4. Improve the definition of the pre-recruit index.
5. Explore existing datasets and ongoing larval surveys for potential link between inshore larvae with stock status/recruitment.

APPENDIX I – TERMS OF REFERENCE

2J3KL Witch Flounder Stock Assessment

Regional Peer Review – Newfoundland and Labrador Region

May 9, 2018
St. John's, NL

Chairperson: Dawn Maddock Parsons

Context

The status of the Witch Flounder (*Glyptocephalus cynoglossus*) stock in Northwest Atlantic Fisheries Organization (NAFO) Divisions 2J and 3KL has been assessed by NAFO previously, most recently in 2016 (Maddock Parsons et al., 2016). 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).
- Review current NAFO Limit Reference Point (LRP) and identify status relative to LRP.
- Identify indicators that should be evaluated during the years without a formal stock assessment.
- Evaluate the impact of maintaining or changing 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
- Indigenous groups
- Fishing Industry
- Academia
- Non-governmental organizations

References

Maddock Parsons, D., Ings, D., Healey, B., Tulk, F. and R. Rideout. 2016. Witch Flounder in NAFO Divisions 2J, 3K and 3L. NAFO SCR Doc. 16/061. Ser. No. N6639: 33p.

APPENDIX II – LIST OF PARTICIPANTS

NAME	Affiliation
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