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Proceedings of the Regional Peer Review Meeting for the Assessment of NAFO Subdivision 3Ps Haddock and Pollock

Meeting date: December 12-13, 2018
Location: St. John's, NL

Chairpersons: Dale Richards and Travis Van Leeuwen
Editor: Brittany Keough

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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 Northwest Atlantic Fisheries Organization (NAFO) Subdivision 3Ps Haddock and Pollock was held on December 12, 2018, in St. John's, NL. The assessments were requested by Fisheries Management Branch to provide the Minister with detailed advice on the status of the stock in order to inform management decisions for the 2019 fishing season.

This Proceedings Report includes abstracts and summaries of meeting discussions, as well as a list of research recommendations. The meeting Terms of Reference, agenda, and list of participants are appended.

INTRODUCTION

A Regional Peer Review Process for the Assessment of Northwest Atlantic Fisheries Organization (NAFO) Subdivision 3Ps Haddock and Pollock was held on December 12, 2018, in St. John's, NL. The assessments were requested by Fisheries Management Branch to provide the Minister with detailed advice on the status of the stock in order to inform management decisions for the 2019 fishing season.

This Proceedings Report includes abstracts and summaries of meeting discussions, as well as a list of research recommendations. The meeting Terms of Reference, agenda, and list of participants are appended.

PRESENTATIONS

OCEANOGRAPHIC VARIABILITY IN NAFO DIVISION 3PS DURING 2018

E. Colbourne and G. Maillet

Presenter – G. Maillet

Abstract

Oceanographic conditions in Subdivision 3Ps are influenced by several factors, including local atmospheric climate conditions, advection by the Labrador Current from the east and the warmer and saltier Gulf Stream waters from the south as well as the complex bottom topography in the region. Near bottom temperatures, while showing significant variability from one year to the next, have experienced a general warming trend up to 1.5°C in some areas since 1990.

Oceanographic data from 3Ps during the spring of 2018 indicate sea surface temperatures, except for a cold anomaly in later spring and early summer, were generally near-normal or above normal. Bottom temperatures increased significantly over 2017 to about 1°C above normal in some areas, with a corresponding decrease in the amount of cold Labrador Current Shelf water overlying the bottom area. The extreme temperature values in some of the deeper waters of the Laurentian Channel and the southeastern St. Pierre Bank, which showed positive anomalies (up to +4°C) in 2017, decreased to more normal values in 2018, however the portion of the bottom habitat covered by warmer water (5°-7°C) have remained higher than the long-term mean during the past few years. The extent of cold intermediate layer waters (CIL) also decreased over the previous year to below normal (warmer) conditions.

Satellite remote sensing data indicate continued lower intensity and magnitude of the spring bloom in 3Ps and across the Grand Bank during recent years (2015-18). The timing metrics of the spring bloom which include the time of the peak magnitude and duration are returning to near normal based on the climatology in 2018.

Zooplankton biomass on the Grand Bank and Newfoundland Shelf are normally dominated by large, energy-rich calanoid copepods, which represent important prey for planktivorous fish and early life stages of demersal fish. In 2018, the biomass of both small and large size fractions of zooplankton in 3Ps and ocean monitoring sections over the Grand Bank and northeast Shelf continue to remain near the lowest levels observed in the time series. Reduction in 1° and 2° productivity indicates lower ecosystem production potential and the observed shift in zooplankton community structure from the dominant *Calanus* species to small taxa may have consequences for transfer efficiency to the upper trophic levels.

Discussion

In 2018, bottom temperatures in 3Ps remained above normal. It was asked if the extreme changes in sea surface temperature (SST) within a year is normal and expected. The response was that this is normal as SST typically mirrors air temperature with a one month lag. The SST range has remained near-normal or above normal.

It was noted that the spring phytoplankton bloom in 3Ps has been smaller in recent years, and asked if it could relate to the reduction in zooplankton. *Calanus* species represent a significant portion of the total biomass of zooplankton and these calanoid copepods have declined significantly compared to the smaller copepods and other small zooplankton. It was stated that the reduction in zooplankton may be linked to the low spring bloom. Recent years indicate lower production potential and transfer efficiency to the upper trophic levels.

FISH COMMUNITY TRENDS

Presenter – M. Koen-Alonso

Abstract

The ecosystem structure of the Newfoundland and Labrador (NL) bioregion can be described in terms of four Ecosystem Production Units (EPUs): the Labrador Shelf (2GH), the Newfoundland Shelf (2J3K), the Grand Bank (3LNO), and southern Newfoundland (3Ps).

These EPUs coarsely represent functional ecosystems, and have been used as geographic boundaries for the estimation of fisheries production potential (FPP) using ecosystem production potential models. Estimated FPP distributions, together with proxies for the current productivity state of the EPU, which in the case of 3Ps was based on the ratio of the landings before and after the 1990s regime shift, have been used to construct guidelines for total ecosystem catches, which represent an approximate upper limit for sustainable total catches for aggregates of species representing functional nodes in the ecosystem structure. These functional nodes of "guilds" closely match the fish functional groups used to describe the status and trends of the fish community, but they do not map them perfectly; these guilds represent a higher level of aggregation. In the case of 3Ps, since this ecosystem sits at the boundary between temperate and sub-arctic regions, two sets of model parameterizations were considered, one representing a temperate ecosystem and another representing a sub-arctic ecosystem.

While the results of these modelling exercises for 3Ps are only exploratory at this stage, they suggest that overall productivity in 3Ps is likely impaired to levels similar to the Grand Bank (3LNO), suggesting a consistent picture of reduced productivity across the entire NL bioregion. Catches for functional guilds in the model show different patterns. Planktivore and benthivore catches are below their guidelines, catches for piscivores have been around the limit since 2010, and suspension feeding benthos are on the rise and potentially moving into unsustainable levels from an ecosystem perspective. The implications for cod in these results are that while piscivores catches have been at the limit of ecosystem sustainability in recent years, earlier catch levels were likely above. Even though these results remain exploratory, they still suggest that increasing catch levels for cod beyond current values could push exploitation levels beyond ecosystem-level sustainability.

Analyses of fishing effort distribution in 3Ps show clear areas of concentration, with differences in the use of space by different fisheries. While the groundfish fishery partially overlaps with Significant Benthic Areas (gorgonian coral and sea pen habitats) along the edge of the shelf,

most core fishing grounds do not overlap with these areas. Still, no protection currently exists for coral and sea pen habitats in the areas where overlaps do occur.

The overall biomass of the fish community declined in the late 1980s and early 1990s. This decline also involved changes in the structure of the fish community, and a decline in fish size. Since the mid-late 1990s, the overall biomass of the fish community has not increased significantly, oscillating around an index level of 280 thousand tonnes. After 2014 total biomass showed reduced levels in comparison to precedent years, but increased in 2018. Abundance increased in the late-2000s, peaked around 2013, and declined afterwards. This increase was mainly driven by planktivores and plankpiscivores. The 2018 abundance level is comparable to the mid-1990s. Fish size (BA Ratio) declined in the late 2000s and has remained at that lower level, but planktivores and medium benthivores showed positive anomalies in 2018. The piscivore functional group used to be highly dominated by Atlantic cod. Since 2012, silver hake increased its dominance, rising to similar dominance levels as cod. Pollock is a minor player among piscivores, and it is currently at low levels in comparison with the earlier 2010s. The large benthivores functional group is dominated by American plaice and thorny skate. Haddock is a minor player of this groups; its biomass over the last 3-4 years has been on the lower end of the Campelen time series. While the overall picture of reduced productivity remains, results from the 2018 survey suggest that some conditions may be improving.

Regarding the order of magnitude of consumption, the fish community in 3Ps is estimated to consume food in the range of 1-2 million tonnes per year. Within this envelope, Piscivores are estimated to eat in the order of 150-600 thousand tonnes per year, while Large Benthivores consume in the order of 250-550 thousand tonnes per year. Although diet time series in 3Ps are far from complete, the available evidence indicates that diets are highly variable in this region, suggesting that food availability may also be highly variable.

Although cod stomach content weights in 3Ps suggest a possible change from the declining trend observed in recent years, values remain on the low side. The trend in turbot does not suggest an improvement in foraging conditions. Stomach content weights for cod and turbot suggest that 3Ps may be comparatively more food limited than other ecosystems. The observed differences in trend between these two predators could indicate patchiness/spatial variability in the prey field.

In summary, ongoing warming trends, together with an increased dominance of warm water species and reduced fish sizes across many fish functional groups, indicate that this ecosystem is undergoing structural changes. Although there are some positive indicators (e.g. some improvements in biomass and a more piscivore diet for cod), these signals are not widespread nor fully consistent across the fish community. Exploratory analyses on fisheries production potential suggest that piscivores are likely fully exploited in 3Ps. Increases in catches could push exploitation for this guild into unsustainable levels. While catches for suspension feeding benthos have spiked above, other functional guilds appear below their estimated guidelines for total catches. The available evidence suggests that while there are some positive signs, the ecosystem likely remains under reduced productivity conditions. Consistent with this general perspective, both haddock and pollock have been at low levels since the mid-2010s.

Discussion

It was noted that in terms of overall biomass, Haddock is a particularly minor player in 3Ps.

It was noted that the stomach content weight analysis excluded empty stomachs in 3Ps; however, these data could show foraging conditions and the possibility of declining food accessibility for species found in 3Ps. It was explained that empty stomach data were excluded

to reduce uncertainty in analyses of those that are feeding and establish a conservative average for stomach content analysis.

ASSESSMENT OF HADDOCK (*MELANOGRAMMUS AEGLEFINUS*) IN NAFO SUBDIVISION 3PS

Presenter: Laura Wheeland

Abstract

Information available to evaluate stock status of Haddock (*Melanogrammus aeglefinus*) in NAFO Subdivision 3Ps consisted of commercial landings data (1953-2017) and information from Canadian spring RV trawl surveys (1972-2018). Haddock recruitment in 3Ps is sporadic, with the fishery historically harvesting few large year classes. The commercial fishery for 3Ps Haddock peaked in the early-1950s, reaching a high of 58,000 t, largely due to the exceptional 1949 year class. A smaller peak occurred in the mid-1980s driven by the 1982 year class. A moratorium on directed fishing for this stock has been in place since 1993. Landings from bycatch averaged 332 t over 2013-17, with the largest proportion caught in the Atlantic Cod fishery. Depth stratified random bottom trawl surveys are completed annually in the spring in Subdivision 3Ps, with data available from 1972-2018. However, conversion factors are not available between gear types; therefore the current data series (Campelen, since 1996) cannot be directly compared to previous periods. Indices of biomass, abundance, and spawning stock biomass (SSB) have been at or below the Campelen series average for the last four years (2015-18). There were no recruits (≤20.5 cm) caught in the survey in 2017 or 2018. While Haddock are thought to be largely impacted by environmental conditions, no direct links could be made for this stock between stock status and available thermal habitat, or plankton timing and recruit survival.

An overview of the status of Haddock in adjacent areas (The Grand Bank, Southern Gulf of St. Lawrence, Scotian Shelf and Bay of Fundy) based on published literature was provided. Some synchrony in indices and recruitment was evident between the 3Ps and 3LNO stocks.

A limit reference point (LRP) was proposed for this stock based on the International Council for the Coloration of the Sea (ICES) Advice Technical Guidelines for "Spasmodic Stocks" – defined as stocks with occasional large year classes. For stocks with this characteristic, B_{LIM} is set based on the lowest SSB where large recruitment is observed. As no gear conversions exist for this stock, B_{LIM} was proposed at SSB = 1998, the lowest available SSB index in the Campelen series to yield a large recruitment event.

Discussion

It was discussed that the distribution map shows the distribution of the Haddock stocks within 3Ps and 3LNO but it does not show if the two stocks are connected. The map suggests the stocks move between the two subdivisions but growth rate is higher in 3Ps in comparison to 3LNO; however, temperatures can be higher in 3Ps. Size frequencies have been similar between the two divisions, suggesting similar length structure between the two stocks within a year. No tagging data are available from which to inform on movements. The maps will be updated in the future to show the temperature fluctuations as Haddock prefer warmer water. It was highlighted that there are no projects currently planned which would inform on whether the two stocks are connected, as Haddock is a bycatch species, and relatively small in comparison to other species in 3Ps.

A participant commented that harvesters see small Haddock in gill nets in the Halibut Channel, approximately 35-40 cm in size. The participant suggested that the 3Ps and 3LNO stocks are different (i.e. small in size in 3Ps and large in size in 3LNO).

A participant asked whether the lack of pre-recruits in the multispecies survey in recent years could have been a result of differences in survey coverage. It was clarified that survey coverage has been consistent throughout the time series in this division, so this absence of these pre-recruits from the survey catch are not due to survey coverage.

During the 2014 assessment, a LRP was discussed but not accepted. There is no model for this stock, and attempts to fit surplus production models have been unsuccessful. The LRP proposed in the 2018 stock assessment is the value of the survey SSB from 1998, the lowest available SSB index in the Campelen series to yield a large recruitment event. High recruitment events outside of the Campelen series were examined, but were not considered for the definition of an LRP as no conversion factors are available between gears for this species, and therefore earlier SSB indices would not be comparable to current or future survey indices.

Based on the available Haddock data, the logic of using the survey SSB index of 1998 was agreed to be sound, and the rationale for this approach is consistent with ICES developed guidelines for setting a LRP based on stock recruit relationships for different stocks. As more surveys are completed in this stock, the LRP can be re-evaluated, in particular if smaller SSB yields a large recruitment. It was noted that it would likely take the occurrence of a large recruitment to change the LRP. The difference between using female SSB versus total (male + female) SSB was discussed, and it was agreed upon to use the total SSB for the LRP.

It was asked how the high recruitment events were defined and how the 90th percentile was selected. It was explained that whatever value used to define "high" would be somewhat subjective. A variety of levels were considered in the choosing of this point for the current LRP discussion. The 90th percentile was chosen to constitute above average recruitment levels, while not being so high as to represent only the largest recorded recruitment events. Given the distribution of the data is skewed towards very low recruitment with a number of years at or near zero, lower percentiles examined (i.e. below the 85th percentile) extended into negative anomalies indicating levels of below average recruitment.

A participant suggested that simulation testing of the LRP would strengthen the argument for this point. It was stated that creating a simulation would be difficult as data are limited and recruitment is unpredictable. Therefore attempts to simulate the population would not likely be an accurate reflection of the population dynamics.

It was decided that a single survey point will be used to define status relative to B_{LIM} as a rolling average will probably not work, given how often the stock fluctuates.

The question was raised what will trigger a reassessment of the Haddock stock. A number of triggers were discussed and it was decided that triggers should reflect the unpredictable dynamics of the stock. Triggers should be responsive to both increases and declines in the stock, and react to high recruitment events which may impact the level of the LRP.

ASSESSMENT OF POLLOCK (*POLLACHIUS VIRENS*) IN NAFO SUBDIVISION 3PS

Presenter: E. Lee

Abstract

An overview of the status of the NAFO Subdivision 3Ps Pollock stock is provided. Sources of information included data from commercial landings (1960 to 2017) and data from the Department of Fisheries and Oceans (DFO) research vessel (RV) surveys (1972-2017).

Although Pollock in Subdivision 3Ps have been fished commercially since the early-1960s, since 1991 it has generally been a bycatch fishery. Catches of Pollock in the early-1960s declined from 4,500 t in 1960 when most of the catch was taken by Spain. Since the extension of jurisdiction in 1977, catches have been mainly taken by Canada and France (St. Pierre). Catches were generally low from 1967-82 being less than 1,000 t annually. Catches gradually increased, peaking at 7,500 t in 1986 with the entry of the French Metropolitan fleet to the cod fishery. During the cod moratorium (1992-97) bycatches declined to pre-1980s levels and were less than 500 t. Bycatches since the 3Ps cod fishery reopened in 1997 have increased slightly but remain less than 1000 t annually. Reported commercial bycatch of Pollock has remained relatively consistent from 1992 to 2017, ranging below 1,000 t. Bycatches in recent years (2014-18) were in the range of 250 to 600 t.

Estimates from biomass and abundance indices are highly variable over the 1971-83 (Yankee 41.5 Ottertrawl), 1984-95 (Engel 145 Ottertrawl), and 1996-2017 (Campelen Shrimp Trawl) time series. Indices were generally low during the early 1970's and increased from the late-1970s to a time series peak in the mid-1980s. Indices generally stayed low until 2009 but spiked in 2010 and 2012, after which a downward trend was evident from 2014 to 2017.

It is important to note that this assessment attempts to monitor a semi-pelagic species with the use of a bottom trawl and survey trends are therefore unlikely to reflect true stock trends. Hence, the information available is not considered suitable to assess stock level and provide catch options. However, it is clear that pollock have never occurred in Subdivision 3Ps in large numbers. Their contribution to the groundfish fishery is based on the infrequent occurrence and survival of year-classes in the extreme north of their range.

Discussion

Newfoundland waters represent the northern limit of Pollock and population size has been largely regarded as being insufficient to support a major fishery. The majority of Subdivision 3Ps Pollock have been found in the slope waters, >150 m, of the Burgeo and St. Pierre Banks and Halibut Channel.

The question was asked how the female SSB was calculated for Pollock. Proportion of Pollock mature at a given length was calculated using annual maturity ogives based on data collected during the annual DFO spring survey in 3Ps. Biomass was calculated using the length-weight relationship for Pollock. To obtain the SSB, the proportion mature at a given length was multiplied by the weight of those fish at the same length and the abundance of Pollock at that length. Due to scarcity of fish captured and resulting maturity data in many years, these maturity estimates are tenuous and are probably not suitable for estimation of annual maturity ogives, therefore reducing confidence in the estimates of SSB.

Given that the DFO multispecies bottom trawl survey is not considered to adequately sample this semi-pelagic species the question was raised if there is another way to assess this stock. It was noted that within other regions of DFO (i.e. Maritimes) that assess Pollock, bottom trawl surveys are also not seen as representative of stock status. The conclusion was it would require

separate pelagic sampling (e.g. acoustic surveys), but this is unlikely to occur in Newfoundland given the high investment required for this sort of targeted sampling effort relative to the presumed size of the stock in this most northerly portion of Pollock's range. It was asked whether acoustic/pelagic sampling of Pollock could be incorporated with the capelin/pelagic survey; however, this sampling doesn't occur near the area Pollock are located, and it was confirmed that Pollock have never been encountered in the DFO-NL Capelin acoustic survey.

It was also noted that there are limited samples (e.g. length frequencies) collected from commercial landings (bycatch) of this stock.

Given the limited information available on Pollock in 3Ps and the consensus that the DFO multispecies survey is not likely representative of stock size, the meeting is unable to provide information on stock status. It was noted that this is likely to remain the case going forward in the absence of new sources of information.

The participants discussed options for an LRP, but current data are not considered representative of stock status, and there are no new sources of information for Pollock, nor is there any new sources on the horizon; therefore, an LRP was not agreed upon.

RESEARCH RECOMMENDATIONS

Further analyses are recommended to examine the spatial distribution of Haddock in Divs. 3Ps and 3LNO, including by length and considering environmental variables (temperature, depth), aiming to inform on the connectivity of these two adjacent stocks in the absence of tagging and movement data.

APPENDIX I: TERMS OF REFERENCE

ASSESSMENT OF NORTHWEST ATLANTIC FISHERIES ORGANIZATION (NAFO) SUBDIVISION 3PS HADDOCK AND 3PS POLLOCK

Regional Peer Review – Newfoundland and Labrador Region

December 12-13, 2018
St. John's, NL

Chairpersons: Travis Van Leeuwen and Dale Richards

Context

The status of Northwest Atlantic Fisheries Organization (NAFO) Subdivision 3Ps Haddock and 3Ps Pollock were last assessed in October 2014 (DFO 2014). The main objectives were to evaluate the status of the stock and to provide scientific advice concerning conservation outcomes related to various fishery management options.

The current assessments were requested by Fisheries Management Branch to provide the Minister with detailed advice on the status of the stock in order to inform management decisions for the 2019 fishing season.

Objectives for the 3Ps Haddock Assessment

- Provide an ecosystem overview (e.g., environment, predators, prey) for the stock area.
- Assess and report on the current status of the 3Ps Haddock stock. In particular, assess survey biomass and distribution. Describe these variables in relation to historic observations.
- Identify a Limit Reference Point for this stock.
- Highlight major sources of uncertainty in the assessment.
- Identify indicators that should be evaluated during the years without a formal stock assessment.
- Report on the distribution of this stock in other areas (e.g. 3NO).

Objectives for the 3Ps Pollock Assessment

- Provide an ecosystem overview (e.g., environment, predators, prey) for the stock area.
- Assess and report on the current status of the 3Ps Pollock stock. In particular, assess survey biomass and distribution. Describe these variables in relation to historic observations.
- Identify a Limit Reference Point for this stock.
- Highlight major sources of uncertainty in the assessment.
- Identify indicators that should be evaluated during the years without a formal stock assessment.
- Report on the distribution of this stock in other areas (e.g. 3NO).

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document

Expected Participation

- Fisheries and Oceans Canada (DFO) (Science and Fisheries Management Branches)

- French Research Institute for Exploitation of the Sea (IFREMER)
- Provincial Department of Fisheries and Land Resources
- Fishing Industry
- Academia
- Indigenous groups
- Non-government organizations

References

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

DFO. 2014. Stock Assessment on Subdivision 3Ps Pollock. DFO. Can. Sci. Advis. Sec. Sci. Advis. Rep. 2014/042.

APPENDIX II: AGENDA

Wednesday, December 12

Time	Topic	Presenter
09:00	Opening remarks and overview of Regional Peer Review Process	*D. Richards/T. Van Leeuwen*
-	Presentation: Environmental and Oceanographic Update	*E. Colbourne/G. Maillet*
-	Fish Community Trends	*M. Koen-Alonso*
-	Presentation: Haddock Assessment	*L. Wheeland*
-	Presentation: Pollock Assessment	*E. Lee*
-	Discussion and Conclusions	*All*
-	Drafting of Summary Bullets	*All*
-	Drafting of Research Recommendations	*All*
-	Upgrade of Working Papers to Research Documents	*All*

Thursday, December 13

Time	Topic	Presenter
09:00	Continuation of Discussions from Day 1 (if required)	*All*
-	Closing remarks and adjourn	*D. Richards/T. Van Leeuwen*

APPENDIX III: LIST OF PARTICIPANTS

Name	Affiliation
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