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Proceedings of the regional peer review meeting of the assessment of stock status of winter flounder (*Pseudopleuronectes americanus*) from the southern Gulf of St. Lawrence (NAFO Div. 4T)

February 23, 2012
Moncton, New Brunswick

Chair of the meeting: Gérald Chaput

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Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

A regional advisory process meeting was held February 23, 2012 in Moncton (NB) to conduct a science peer review of the assessment of stock status of winter flounder (*Pseudopleuronectes americanus*) from the southern Gulf of St. Lawrence (NAFO Div. 4T), from the southern Gulf of St. Lawrence. The science review was conducted in response to a request from DFO Fisheries and Aquaculture Management (FAM). Participants at the science review included science staff from the DFO Gulf, Maritimes and Newfoundland regions, personnel from DFO FAM, and from the fishing industry. Most of the terms of reference for the meeting were addressed, excluding those related to the development of reference points and on ecosystem considerations. The products of the meeting include a science advisory report and supporting research documents.

SOMMAIRE

Une réunion du processus consultatif régional a eu lieu le 23 février 2012 à Moncton (Nouveau-Brunswick) afin de mener un examen scientifique par les pairs de l'évaluation de l'état du stock de la plie rouge (*Pseudopleuronectes americanus*) du sud du golfe du Saint-Laurent (division 4T de l'Organisation des pêches de l'Atlantique Nord-Ouest [OPANO]). Cet examen scientifique a été réalisé en réponse à une demande formulée par la Gestion des pêches et de l'aquaculture de Pêches et Océans Canada (MPO). Les participants à l'examen scientifique comprenaient des membres du personnel scientifique des régions du Golfe, des Maritimes et de Terre-Neuve-et-Labrador, des employés de la Gestion des pêches et de l'aquaculture du MPO, et des membres de l'industrie de la pêche. La majorité du cadre de référence de la réunion a été abordée, à l'exception des éléments liés à l'élaboration de points de référence et aux considérations écosystémiques. Les résultats de la réunion comprennent un avis scientifique et des documents de recherche à l'appui.

1. INTRODUCTION

The Department of Fisheries and Oceans (DFO) conducted a regional peer review meeting on February 23, 2012 in support of a request from DFO Fisheries and Aquaculture Management for an assessment of the stock status of winter (Pseudopleuronectes americanus) from the southern Gulf of St. Lawrence (NAFO Div. 4T). The terms of reference for the peer review meeting are provided in Appendix 1.

The meeting began at 9:00 AM. The chair opened the meeting by welcoming the participants and reviewing the meeting room arrangements including the availability of simultaneous translation services for the meeting participants. The chair explained the process of requesting science advice, preparation of the meeting materials, the science review, and the expected outcomes. A science advisory report, a proceedings document and a research document(s) are the expected products of the meeting.

The chair reviewed the rules of exchange for the meeting, reminding participants that the meeting was a science review and not a consultation. As well, everyone at the meeting had equal standing as participants as there was no observer status at the meeting. Table microphones were provided to ensure good communication during the meeting. Finally, the objective was to achieve consensus on the status of the stocks and the conclusions relative to the terms of reference. For the purposes of the science review, consensus was taken as an absence of opposition.

The chair then invited the participants to introduce themselves; the list of participants is provided in Appendix 2.

The draft agenda was reviewed and accepted (Appendix 3).

There was one working paper to be reviewed. It was distributed by email to meeting participants on February 20, 2012. Two other information documents were provided to participants: 1) Sentinel survey report for 2011, and 2) Research survey report for 2011.

Rapporteur duties were assigned to Sophie LeBlanc (DFO Science Gulf Region).

The working paper was presented by Rod Morin, DFO Science Gulf Region.

2. FISHERIES AND LANDINGS

Although the category of flatfish (unspecified) that is used to record some landings may contain some winter flounder, that alone does not explain the absence of landings for 1984.

The Magdalen Island bait fishery was the subject of much discussion. Some aspects of the fishery and the characteristics of the catch were analysed in DFO (2010. Special Science Response 2009/020). The fishery is prosecuted with smaller boats and small trawls near shore and captures large numbers of small winter flounder. The fishery was initiated on an experimental basis and is to be terminated in 2012. The demand for bait has resulted in increased commercial effort around this area in recent years.

2.1 Size, age, and maturities

There were inconsistencies in Figures 6 and 7 in the working paper describing relative length frequencies. This would be verified and corrected.

Sampling for length and for age has not occurred annually. Reconstructions for some years are derived by borrowing information from sampled years. This assumes that growth rates were similar within blocks of years. It was noted that growth rate has changes and this is tracked at a coarse level, over about five steps.

Concerns regarding the reliability of the age determinations from otoliths were resolved by an exchange with the laboratory in Woods Hole. It was agreed that the ages interpreted by DFO Gulf Region were correct. There is a reference collection and the same ageing criteria were applied through the time series.

In reference to Figure 18 in the working paper, there are large changes in size at age, particularly for small / young fish. The change represents a halving of the length of flounder of age 1 and 2 in the recent decade relative to the previous periods. There were very few small fish in the early part of the time series and the size at age for these younger fish may be poorly estimated for the earlier time period.

Maturity ogives from the 1975-1982 sampling period were used. There was some confusion in staging criteria during the 1990s and 2000s. There was also confusion with using maturity codes specific to American plaice. Analysis of cod data indicated that at least in the last three years, this confusion had been corrected. This was not examined for winter flounder. The maturity schedules are not used in the population model but are important in the development of reference points.

3. POPULATION MODELLING

3.1 Abundance indices

Abundance indices are available from the September Research Vessel (RV) survey, the Sentinel survey, and the Northumberland Strait survey.

3.1.1 September RV Survey

There are ten survey strata with winter flounder catches and these catches are in the shallower strata at the limit of the survey capability. The survey has a depth limit of 16-17m. There is large interannual variability in the catch rate indices, the greatest variation is seen in the catch rates by number rather than catch rates by weight, the result of larger variations in catches of small winter flounder. There are a lot of uncertainties regarding the inshore/offshore movements and some of the variability in the index may be related to the fringe effect of the survey and movements.

3.1.2 Sentinel survey

Covers the same strata as the RV survey and does not provide additional information on nearshore / inshore abundance.

3.1.3 Northumberland Strait Survey

This survey began in 2000 and covers shallow inshore areas of the Northumberland Strait. The coverage as well as vessels and gears have varied over time. Winter flounder are an abundant component of the catch and distributed throughout the area with concentrations noted in the northwestern part of the strait. It cannot be used at this time as an index of abundance in population modelling.

3.1.4 Abundance indices by area

Being predominantly a nearshore species with adhesive eggs, population structuring could be expected, especially between areas separated by deeper water, for ex. Magdalen Islands and fishing depletion might be expected to occur. Larvae are pelagic so some broader transport would be expected. Based on tagging, movements of 60-70 km were noted. In some areas, the fishery occurs in shallower waters than covered by the RV survey, for ex. Magdalene Islands.

The preferred habitat for winter flounder is shallow and smaller fish are inshore which is a weakness of the RV survey as an index of the 4T stock. However the RV survey indicates that there has been a decline in abundance of large fish and that there are long term changes in the stock.

3.2 Model formulation

The population is a VPA implemented in AD Model Builder. Natural mortality (M) is modeled as a random walk for two age groups, 3-8 years and 9+ years. The index of abundance is the RV survey index of abundance at age 3 to 11 years. Catchability was constrained to between 0.00674 and 0.67, the upper bound considered reasonable based on the survey coverage versus the distribution of winter flounder in the southern Gulf.

3.2.1 Catchability estimates

The catchability coefficient (q) is constrained in the model. When the constraint is released, the estimates peak at 4.5, which is not considered plausible. Releasing the constraint results in large changes in population estimates. A more important concern is the lower bound on q which is where the model converges to for small fish. This results in very large population estimates for those age groups which are subsequently killed off by high M to match the lower estimated abundances of older flounder.

3.2.2 Natural mortality

M is estimated to be high for this species and has been increasing for the small fish component. Historically, high M estimates may be confused with unaccounted bycatch / discarding mortality. However in recent years, fishing effort is greatly reduced. In the model, estimation of M is

partially confounded by estimation of q, as mentioned above. When verified, there was no retrospective pattern on estimates of M.

Given the concern about potential discarding in the past, it was suggested that one option may be to model M differently by time period, but this was not to be explored at this meeting.

3.2.3 Conclusions on model results

The RV index for winter flounder is not as strong as for other species due to the spatial distribution of the species and the corresponding coverage of the survey. The survey indices do characterize the changes in stock structure, such as the decline in large fish. The survey is on the margin of winter flounder distribution and the availability can change. The catchability (i.e. distribution of winter flounder) may be density dependant and the changes in abundance inferred by the RV may be overestimated. There is a retrospective pattern in estimates in recent years, with a tendency to overestimate abundance of ages 3 to 5, SSB and recruitment.

Plots of Spawning Stock Biomass (SSB) should show the contribution by age. The concern is that the SSB is being maintained by young age groups of winter flounder whose abundance may be overestimated due to concerns about q. It would be useful to put the estimates of SSB for winter flounder in perspective to other species in the southern Gulf. For example, the SSB for American plaice (age 4+ years) over the period 1985 to 1995 is estimated to have been between 100 and 150 thousand tons while the winter flounder SSB estimates from the model for the same time period are between 100 and 180 thousand tons. So the biomass of a broadly distributed species like American plaice was less than that of winter flounder whose distribution is more inshore. These types of coarse comparisons could be used to conclude on plausibility of the model outputs. As well, abundance of winter flounder in overlapping areas of the RV survey and the Northumberland Strait could be examined.

4. REFERENCE POINTS

This is the first time a population model has been developed for winter flounder from the southern Gulf. Given the issues concerning the population modelling described above, it was not possible at this time to go further and develop proposals for reference points.

5. IMPACTS OF FISHERIES

Commercial fisheries and those for bait, such as those in the Magdalene Islands, catch several species of flatfish including yellowtail and winter flounder. Quantification of the bycatch of winter flounder in other fisheries could not be done at this time, there were some irregularities in the observer database that could not be reconciled.

Winter flounder are present in coastal waters and they are an important bycatch in the smelt fishery. There was a study of the bycatch in the smelt fishery in Miramichi Bay in the mid-1990s. These studies and potentially others should be examined to assess the potential impacts of these other fisheries on winter flounder.

6. ECOSYSTEM CONSIDERATIONS

This term of reference was not discussed in the working paper. In general discussion, winter flounder are observed in the diet of grey seal and flatfish, up to 30 cm in length are a common component of the diet. There is also some information on diets of cormorants that may show that winter flounder are consumed by birds.

6. SUMMARY OF UNCERTAINTIES

There are uncertainties around biology, ageing, maturities at length and at age. Otoliths of winter flounder have been collected from the RV survey although age interpretation is not current. The otoliths are available and if aged could provide recent information on size at age.

Stock structure for winter flounder in the southern Gulf has not been examined.

The representativeness of the RV survey index for a coastally distributed species is uncertain.

Estimates of SSB are based on assumptions in the model. The model estimates for M are high, and may be confounded with estimation of q. However, it is clear from the RV survey that the abundance of larger winter flounder has declined while small sized winter flounder abundance has been variable.

Landings data are incomplete up to the mid 1990's. Sometimes, the fish are reported as flatfish unspecified, at other times, winter flounder landings appear to not have been recorded. The absence of catch in 1984 has the effect of giving a low F with a resulting high M. This can have an effect on estimated of surrounding years.

Further work on the model is encouraged.

7. ADVISORY REPORT AND MEETING PRODUCTS

A draft of the advisory report was completed after the meeting. The draft report was circulated to meeting participants on March 12, 2012 and finalized on April 20, 2012.

The working paper should be upgraded into a research document and should include the corrections to the data and the resulting changes to the population model resulting from the review.

APPENDICES

Appendix 1. Terms of reference for the assessment of stock status of winter flounder (Pseudopleuronectes americanus) from the southern Gulf of St. Lawrence (NAFO Div. 4T)

Context

In support of a request for science advice from DFO Fisheries and Aquaculture Management, DFO Gulf Science Branch will review the status of winter flounder (*Pseudopleuronectes americanus*) of the southern Gulf of St. Lawrence (NAFO Div. 4T). The most recent assessment was conducted in 2002 (DFO 2002). Science advice relative to size at sexual maturity and catch characteristics of the winter flounder fishery in the Magdalen Islands fishery were provided in 2010 (DFO 2010).

Objectives

Assessment of the status of winter flounder in the southern Gulf of St. Lawrence (NAFO Division 4T) including:

Description of present and recent management measures and catches to the end of 2011, including best estimates of total removals by all fisheries.

Overview of species biology and characteristics (size at age, age at maturity, etc).

Indicators of stock status and trends (commercial catch rates, research vessel survey indices) by size and age group (if available).

To the extent possible, estimates of total biomass as derived from population models.

To the extent possible, estimates of absolute fishing mortality rates for the stock.

To the extent possible, develop reference points against which to assess stock status.

Description of the impacts of fishing activities for winter flounder on other species and fish habitat.

Description of the impacts of fishing activities for other species on winter flounder.

Description of ecosystem components which are modifying the species abundance and population dynamics (for example temperature, predators, prey).

To the extent possible, develop indicators of stock status which can be used to inform fisheries management on stock status in the intervening years of the multiannual assessment and management cycle.

Expected publications

CSAS science advisory report

CSAS proceedings report summarizing the discussions of the science review

CSAS research document(s)

Participation

DFO Science Branch

Other DFO Sectors

Provinces

External experts (to DFO)

Fishing industry

Aboriginal peoples

References

DFO. 2002. Winter flounder in the southern Gulf of St. Lawrence (Div. 4T). DFO Science Stock Status Report A3-22 (2002).

DFO. 2010. Size at sexual maturity and catch characteristics of the yellowtail and winter flounder fishery in the Magdalen Islands. DFO Can. Sci. Advis. Sec. Sci. Resp. 2009/020.

Appendix 2. List of participants.

Name	Affiliation
Anderson, Paul	PEI Dependent Groundfish Association
Benoît, Hugues	DFO Science Gulf
Chaput, Gérald	DFO Science Gulf
Fowler, Mark	DFO Science Maritimes
Healey, Brian	DFO Science Newfoundland and Labrador
LeBlanc, Sophie	DFO Science Gulf
Lemelin, Dario	MPO GEP Québec
McDonald, Mike	PEIFA
Melong, Richard	Gulf of Nova Scotia Bonafide Fishermen's Association
Morin, Rod	DFO Science Gulf
Savoie, Luc	DFO Science Gulf
Surette, Tobie	DFO Science Gulf
Swain, Doug	DFO Science Gulf
Wade, Elmer	DFO Science Gulf

Appendix 3. Meeting agenda.

	Thursday February 23
8 30 – 9 00	Meeting room open
9 00 – 9 15	Introduction, review of agenda
9 15 – 10 30	o Description of management measures, catches to the end of 2011 o Overview of species biology and characteristics o Indicators of stock status and trends
10 30 – 10 45	Break
10 45 – 12 15	o Estimates of total biomass as derived from population models o Estimates of absolute fishing mortality rates for the stock. o Reference points against which to assess stock status. o Impacts of fishing activities for winter flounder on other species and fish habitat o Impacts of fishing activities for other species on winter flounder o Ecosystem considerations o Indicators of stock status to inform fisheries management in the intervening years of the multiannual assessment and management cycle
12 15 – 13 15	Lunch
13 15 – 17 00	Follow-up from the morning (if required) Review of draft advisory report
15 00 – 15 15	Break