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Proceedings of the Maritimes Regional Advisory Process

Meeting on the Assessment Framework for 4T Herring

Miramichi Boardroom
Gulf Fisheries Centre

18 – 19 March 2003

Compte rendu du Processus consultatif régional des provinces Maritimes

Réunion sur le cadre d'évaluation du hareng de 4T

Salle de conférences Miramichi
Centre des pêches du Golfe

Les 18 et 19 mars 2003

Robert N. O'Boyle
Meeting Chairperson / Président de réunion

Bedford Institute of Oceanography / Institut océanographique de Bedford
P.O. Box 1006 / C.P. 1006
Dartmouth, Nova Scotia / Dartmouth, Novelle-Écosse
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May 2003

Foreword

The purpose of these proceedings is to archive the activities and discussions of the meeting, including research recommendations, uncertainties, and to provide a place to formally archive official minority opinions. As such, interpretations and opinions presented in this report may be factually incorrect or mis-leading, but are included to record as faithfully as possible what transpired at the meeting. No statements are to be taken as reflecting the consensus of the meeting unless they are clearly identified as such. Moreover, additional information and further review may result in a change of decision where tentative agreement had been reached.

Avant-propos

Le présent compte rendu fait état des activités et des discussions qui ont eu lieu à la réunion, notamment en ce qui concerne les recommandations de recherche et les incertitudes; il sert aussi à consigner en bonne et due forme les opinions minoritaires officielles. Les interprétations et opinions qui y sont présentées peuvent être incorrectes sur le plan des faits ou trompeuses, mais elles sont intégrées au document pour que celui-ci reflète le plus fidèlement possible ce qui s'est dit à la réunion. Aucune déclaration ne doit être considérée comme une expression du consensus des participants, sauf s'il est clairement indiqué qu'elle l'est effectivement. En outre, des renseignements supplémentaires et un plus ample examen peuvent avoir pour effet de modifier une décision qui avait fait l'objet d'un accord préliminaire.

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ABSTRACT

A Regional Advisory Process (RAP) meeting to review the Virtual Population Analysis (VPA) assessment model for use on the 4T herring (spring and fall) stocks, was held during 18-19 March 2003 at the Gulf Fisheries Centre, Moncton, New Brunswick. The meeting focused on the VPA model and, in particularl, the resolution of the retrospective problem noted in 2002. The meeting was not intended to produce advice on the status of the resources for the upcoming fisheries. This occurred during the 4T/4VWX herring RAP meeting held 25-27 March 2003 in Halifax, Nova Scotia. A number of recommendations were made to improve the model, which were implemented at the 25-27 March 2003 meeting.

RÉSUMÉ

Une réunion du Processus consultatif régional (PCR) a eu lieu au Centre des pêches du Golfe, situé à Moncton (Nouveau-Brunswick), les 18 et 19 mars 2003, dans le but d'examiner le modèle d'évaluation fondé sur l'analyse de population virtuelle (APV) en vue de son application aux stocks de hareng de 4T (de printemps et d'automne). Cette réunion a porté surtout sur le modèle d'APV et, en particulier, sur la résolution du problème de profil rétrospectif observé en 2002. Il ne s'agissait pas de formuler un avis sur l'état de ces stocks en prévision des pêches prochaines, ce qui s'est fait ultérieurement lors de la réunion du PCR sur le hareng de 4T et 4VWX ayant eu lieu du 25 au 27 mars 2003 à Halifax. Diverses recommandations en vue d'améliorer le modèle ont été proposées et elles ont été mises en application à la réunion du 25 au 27 mars 2003.

INTRODUCTION

The chair (R. O'Boyle) introduced the participants (appendix 1) and then gave the background to the meeting. During the March 2002 RAP meeting, a severe retrospective pattern had been uncovered in the Virtual Population Analysis (VPA) assessment model of the fall spawning component of the 4T herring resource (LeBlanc et al, 2002; Morin, 2002). This problem necessitated the use of qualitative indicators of resource status as the basis of advice for the 2002 fishery, rather than basing advice on the VPA. He pointed out that the retrospective problem had been observed in other fisheries (Sinclair et al, 1991) and was the subject of much research. As a consequence, it was agreed to have a focused review of the 4T herring assessment framework prior to the 2003 assessment meeting (25 – 27 March 2003 in Halifax). It had been planned to have this review as part of a more extended multi-meeting review of the assessment framework but work on alternate high priority issues only allowed review of the VPA in time for the March 2003 RAP. It is still planned to conduct RAP meetings on the other aspects of the 4T herring assessment (e.g. management objectives, indicators of diversity, decision rules, etc).

The meeting invite package, which includes the remit and agenda, is provided in appendix 2. The chair pointed out that the agenda was flexible to accommodate presentations of work that would arise during the meeting. He emphasized that the main product of the meeting was to be guidance on the most appropriate VPA formulation to be used during the March 2003 RAP meeting, which would also be used until the next in-depth review. The list of documents tabled is in appendix 3.

After addressing some administrative issues, the body of the meeting commenced.

REVIEW OF PROBLEMS ENCOUNTERED IN SPRING 2002 ASSESSMENT

Working Paper: LeBlanc, C. H., C. MacDougall, and G.A. Poirier. 2003. Review of 4T Herring Assessment Framework, March 2003. RAP Working Paper 2003/01.

Presentator: C. LeBlanc
Rapporteur: M. Power

Presentation Highlights

A review of last year's assessment for the 2001 fishery was first presented. This covered the catch trends, sampling, indices of abundance and the assessment models. It was pointed out that the fall component of the resource is larger than

that of the spring, with the approximately 50,000t landed from the fall component being about double that of the spring. Both gillnet catch rates and acoustic survey indices are used for tuning the spring VPA but only the gillnet catch rates are used in the fall's VPA. For the fall component, gillnet catch rates are at a high level while acoustic index has been declining recently. All ages in the fall VPA exhibited severe retrospective patterns and thus the analysis was not accepted last year.

Discussion

It was asked what is the youngest age estimated in the VPA and what is the associated CV. It is age 3 with a 70% CV. There was a comment that the difference in the spring and fall CPUE series might be due to the differing catchability in the spring and fall of the four year olds.

There was a question on the timing of the acoustic survey and how efficient it was in determining stock abundance. This will be discussed later in the meeting.

A question was asked as to why the fall stock TAC had not been taken in many years. Industry participants said that while the spring and fall gillnet fleet did catch their allocation, the seiners didn’t due to market and herring availability; it was not due to a lack of fish.

There was discussion on how representative gillnet catch rates were of abundance. While the spring gillnet fishery uses set nets, the fall gillnet fishery uses drift nets and searches for schools. It thus acts like a seiner fleet. CPUE for this fleet might not be linearly related to abundance. As well, both fleets have experienced a number of regulations, further complicating interpretation of CPUE. It was pointed out that CPUE has not been used in the assessment of other fisheries in recent years due to problems of interpretation.

It was asked how the CPUE was calculated: the daily catch rates are weighted by area using total catch for that area.

REVIEW OF POTENTIAL CAUSES OF THE RETROSPECTIVE PATTERN

Working Paper: LeBlanc, C.H., C. MacDougall, and G.A. Poirier. 2003. Review of 4T Herring Assessment Framework, March 2003. RAP Working Paper 2003/01.

Presentator: C. LeBlanc
Rapporteur: M. Power

Presentation Highlights

The presentation provided an overview of the possible causes of the retrospective patterns seen in the fall spawning component. Potentially missing catch at age was first examined. It was estimated that missing bait landings of up to 2-3kt is possible due to the way these catches are reported, which would have a small impact on the VPA. The possibility of aging errors was also considered. However, age determination comparisons among readers showed about 87% agreement, which is very good, indicating that this is not a likely source of the retrospective problem. The misallocation of spring and fall spawners was also investigated. Outside of the spawning season, the Gonado-Somatic Index (GSI) is used to assign catch to spawning component. This would influence about 20 % of the total catch. The potential impact of this was raised during the discussion subsequent to the presentation. Finally, an overview of our knowledge of the seal populations in the Gulf and how these might be impacting the herring resource was provided. During the presentation, it was mentioned that the total annual consumption of herring by seals in recent years was in the order of 2-3kt. It was pointed out that these data ended in 1996 and more recent information was available. This was discussed at length subsequent to the presentation.

Discussion

There was a question of clarification on the bait fishery statistics. The Supplementary B slips are supposed to record the bait (mostly for lobster fishery) catches. While 2-3 Kt of this is annually recorded, bait was estimated to be about double this (5Kt). Overall, missing catch was not considered a serious problem.

There was a number of questions on how the GSI is used to differentiate the spring and fall spawners over time. The individuals involved in doing this work considered that there have been annual changes in the environment that might be influencing the GSI and thus a review was necessary. However, for the purposes of this meeting, it was noted that reassignment of fish from one component to another was not likely the cause of the retrospective. The fall component is much larger than that of the spring and thus one would expect reassignment to improve the fall and spring fits. However, the fit for the spring is already satisfactory and it is on this component that the reassignment would

have the most impact. It was suggested that reassignment be examined through a sensitivity analysis i.e. reassign 10% catch at age between the two components to see the effect on the VPA calibration. The VPA residual patterns could be examined via bubble plots to see potential reassignment issues. It was noted that only about 20% maximum of the catch at age is based upon GSI assignments as most of the spawner assignment is based upon observed condition. Thus, overall, GSI assignment was not considered an important source of the retrospective problem. However, it was noted that GSI assignment could be more of a problem in relation to survey catch at age. This was to be discussed later in the meeting.

In relation to natural mortality, it was mentioned that seal predation seems to be important for 2-3yr olds in Nfld West Coast studies. The VPA starts at age 4 and so would not be affected by age 2-3 mortality. This raised the issue as to the reliability of the herring size information associated with seal predation. For cod, concerns have been noted on the observation that seals only eat small fish. This might be biased due to seals not eating the heads and thus a lack of older fish otoliths in the stomachs. For herring, one would expect to see a wider range of ages being consumed. To fully incorporate these processes into the VPA, one would need to calculate a catch at age for the seal 'fleet', information that is not readily available. This requires information on not only the sizes of herring consumed but also where and when they are being consumed. Industry participants at the meeting noted that seals are always on the grounds when they are fishing, an observation corroborated by comparing the seal satellite tag data with the dominant areas of fishing. The information in the working paper on seal consumption estimated about 2-3kt of herring consumed annually. These data ended in 1996. More recent unpublished information on seal consumption of herring in the Gulf (up to 2001) gave estimates of 25-30kt being consumed annually. The source of this discrepancy could not be resolved. However, it was noted that recent declines in herring consumption appeared too rapid, given seal production rates. Overall, natural mortality could be an important factor in the assessment but this would require investigation outside of this meeting. This work was encouraged.

- It is recommended that further work on the impact of trends in natural mortality on the 4T herring assessments be undertaken

REVIEW OF ABUNDANCE INDICES USED IN THE ASSESSMENT

Working Paper: LeBlanc, C.H., C. MacDougall, and G.A. Poirier. 2003. Review of 4T Herring Assessment Framework, March 2003. RAP Working Paper 2003/01.

Presentators: C. LeBlanc and G. Poirier
Rapporteur: M. Power

Presentation Highlights

The presentation described how the various abundance indicators (commercial, survey and acoustic) used in the assessment were calculated. It was pointed out that the catch rates (CPUE) are calculated from the logbook information with a phone survey providing the number of nets used, which vary by are and season. The CPUE trends by area within spawning component are sometimes inconsistent, with increases seen in some areas and not others. It was clarified that a multiplicative analysis is first done on the logbook data and then the resulting CPUE trends broken down by age, using the commercial sampling information rather than doing the age differentiation prior to the multiplicative analysis. It was mentioned that this could be problematical if there are severe age-area interactions in the indices.

Discussion

CPUE: there was a concern that CPUE is not linearly related to abundance i.e. as abundance increases, catch rates may asymptote, typical of schooling fisheries. There was considerable discussion on the dynamics of this relationship e.g. soak time, searching behaviour, etc. This requires further detailed examination of the searching dynamics using the available logbook data, work that was encouraged.

It was asked if spatial information on the fishery existed, specifically if zero sets were recorded. They have been since the establishment of DMP in 1999. This was considered a valuable dataset that should be accessed to assist future analyses.

There was considerable discussion of the impact of environment (tides) and regulations (mesh sizes, weekend closures and other closures, trip limits, allocations by area, etc) on catch rates. This has been the rationale for using fishery-independent abundance indicators in other fisheries. The issue of a curvilinear relationship between CPUE and abundance was again raised. This appears to be corroborated through detailed comparisons of CPUE to acoustic estimates of biomass on the same fishing grounds (see below). This suggested saturation effects and led to a discussion on soak times and the impact of these

on catch rates. There was an overall sense that CPUE might not be useable for herring but this was to be discussed further later.

Groundfish Survey: The September groundfish survey has been conducted since 1971, with two strata added in inshore areas in 1984 and the vessel changed in 1985, with only day sets used for the herring time series. Herring aging has been conducted since 1986. It was noted that 40-80% of the spring spawners are ages 1-3, with spawning group assignment solely based on the GSI. For springs, this then might be used as an immature index. As a check on the reliability of the survey as a provider of an abundance indicator, year-class continuity was considered. The latter was low, highlighting the presence of large year effects. In this case, it was queried if an aggregate abundance indicator could be developed. For fall spawners, this would have to include a range of ages, the investigation of which was suggested.

Acoustic Survey: The survey has been conducted since the late 1980s in September-October on concentrations of herring in Chaleur Bay, Miscou Bank and north PEI areas. The survey includes sampling to calculate numbers at age. It was noted that there are a lot of ages 1-3 juvenile herring seen by the surveys. Good year-class tracking was observed for spring spawners but not for fall. The reasons for this were discussed at length. It was considered that, due to their biology at that time of the year, spring spawners are likely reasonably well surveyed. On the other hand, fall spawners are just undergoing spawning behaviour and thus are likely more mobile. In this case, the fall indicator would be expected to be more variable, as it appears to be. It was felt that the acoustic series should not be used for the fall spawning component. Also, the groundfish survey located herring off western Cape Breton at the time of the acoustic survey. This area is not included in the time series due to inconsistencies in sampling over time and conflicts with the lobster fishery. It was pointed out that there is other sampling going on at the time of the survey that it could use. It was recommended that survey coverage and sampling, in association with other survey and fishing activities in the fall be considered so that a more appropriate acoustic survey design might be developed. Further, the aggregated and age disaggregated indices should be investigated separately. Some diagnostics on index continuity would be prepared by R. Mohn during the meeting (see below).

ACOUSTIC INDICES OF LOCALIZED RESOURCES AS PART OF AN ALTERNATE DECISION RULE SYSTEM FOR 4T HERRING

Working Paper: Claytor, R., C. LeBlanc, and A. Clay. 2003. Using Acoustic Indices of Proven Stocks and Decision Rules for Herring Fisheries Management. RAP Working Paper 2003/02.

Presentator: R. Claytor
Rapporteur: M. Power

Presentation Highlights

The presentation summarized a dramatically different approach to the assessment and management of the resource. In essence, it advocated the use of nightly acoustic estimates of herring abundance to control harvesting on an on-going basis during the season and discussed the details on how this approach could be implemented. It is philosophically similar to the approach used for 4VWX herring.

Discussion

It was asked, given that the exploitation rates and biomass are both relative, what's to stop the fleets from fishing down to the last school? This was acknowledged as an unresolved problem. There were concerns raised on the ability of the method to resolve biomass in a reliable manner, as the assumption of a closed stock appears to be violated. Notwithstanding this, the overall approach does have merit and requires further investigation. This would have to be undertaken in parallel to the current VPA – TAC management system until implementation could be contemplated. Certainly, industry support is expected to be high.

It was acknowledged that the approach would require more infrastructure than the current one. This meeting provides an opportunity to have a more in-depth discussion on how such a program could be implemented and what the resource needs would be. It was suggested that a group convene on Wednesday morning to more fully discuss the approach and its requirements and to report back to the plenary later in that day.

AN ANALYSIS OF THE RETROSPECTIVE PROBLEM IN 4T HERRING

Working Paper: Cadigan, N.G. 2003. Diagnostics for the Retrospective Problem in the 4T Fall Herring SPA. RAP Working Paper 2003/06.

Presentator: N. Cadigan
Rapporteur: M. Power

Presentation Highlights

The presentation provided an overview of a detailed examination of the potential causes of the retrospective patterns seen in the VPAs of the fall spawning component. The first step in the analysis was replicating the VPA and retrospective patterns seen in 2002, which was achieved. It was pointed out that, while CPUE might not be linearly related to abundance, based on the previous

discussion, it appears to track VPA abundance historically quite well (figure 6 of working paper). There was however a slight tendency for CPUE to be more stable at higher abundance, consistent with a searching fishery. The analysis then made perturbations to the VPA inputs to see if they could illicit the retrospective patterns. Very large changes had to be made to the catch at age to compensate for the retrospective pattern. These were considered unrealistic. Regarding natural mortality (M), compensation for the retrospective pattern produced unrealistic patterns across age and years. The analysis then focused on the treatment of the CPUE indices in the VPA as the source of the retrospective patterns. The 2002 assessment had treated the CPUE indices pre and post 1991-92 separately. By considering these together as one series in the model but with different catchability coefficients (q), much of the retrospective problem could be resolved. It was therefore concluded that the model formulation to account for mesh size changes during 1991-92 was the likely source of the retrospective problem.

Discussion

It was pointed out that there was a change in 1991-92 in mesh sizes that corresponds to the break points used in the VPA. However, it was felt more productive to not have a break in the analysis but to account for mesh size changes over time using one CPUE time series.

A number of analyses were suggested, including conducting the retrospective analysis back two more years, changing the penalty function on the partial recruitment parameters, and not including the plus group. From the discussion, it was evident that a number of technical issues needed to be considered. It was suggested that a group convene on Wednesday morning to consider these and other points and to report back to the plenary later that day on options to rectify the retrospective pattern in the VPA.

VPA FORMULATION

This section summarizes the discussion of the group that considered the VPA formulation on the Wednesday morning of the meeting along with the subsequent discussion in plenary. However, while the meeting did come to agreement about the general formulation of a VPA, not all issues could be resolved and thus where possible, guidance was given to the assessment team in its preparations for the RAP meeting of 25 - 27 March 2003. These are provided below.

Catch at Age

There was concerns on the current methodology in the VPA used to calculate the abundance and fishing mortality on the oldest ages plus group. It has been shown that inappropriate treatment of the plus group can lead to retrospective

problems. While this is not the likely cause of the retrospective problem, the assessment team agreed to confirm that the plus group in the VPA is being calculated appropriately.

Abundance indices

R. Mohn presented a analysis of continuity within the various abundance indices. This considered the correlation coefficients of all ages between years, all cohorts between years and all cohorts across two years. Overall, the analysis corroborated the observations made earlier in the meeting:

Index	Year Effect	Cohort Effect	Double Cohort Effect
Fall CPUE	0.11	0.46	0.08
Fall Acoustic	0.42	0.27	0.00
Fall Survey	0.20	0.06	0.01
Spring CPUE	0.00	0.51	0.00
Spring Acoustic	0.22	0.54	0.13
Spring Survey	0.42	0.08	0.20

The spring and fall groundfish survey indicators by age have little or no information content. This does not imply that the survey is completely uninformative as investigation of developing an aggregated index for the younger age groups was encouraged for the future. For the purposes of the upcoming RAP meeting, the groundfish survey indices should be considered as ancillary information and not used in the VPA.

Regarding the acoustic indices, that for the spring was considered adequate. A concern was raised regarding the 1994 high point. This might be overly influencing the trend in the series and might be an underlying reason for the difference between the trends in the CPUE and acoustic indices. Without the 1994 point, the series were much more similar. It was considered useful to investigate in detail the differences between the CPUE and acoustic indices.

- It is recommended that the spatial distribution of age 4 abundance in the acoustic and CPUE indices as well as that of the 1994 acoustic survey be analyzed and the assessment conducted with and without the 1994 acoustic survey point to determine its impact on the assessment

It was considered that the continuity within the fall acoustic survey was too low to justify its use as an indicator of abundance, consistent with comments made during the meeting.

The continuity in both the spring and fall CPUE indices were considered adequate for use in an age-based model calibration. One issue that would benefit further investigation was the possibility of obtaining information on the distribution

of the resource for comparison with the distribution of the fleets on which the abundance indicators are based. In the past, attempts have been made to establish index fishermen programs, to no avail. Renewed attempts to establish an index program were encouraged.

- It is recommended that, through the Gulf Small Pelagics Advisory Committee, a volunteer index program be investigated; also, this initiative should investigate the collection of missing log books.

There was discussion on the most appropriate weighting of the logbook data. The current analysis weights the individual observations by the catch. An alternate approach, similar to the way survey information is treated, is to define areas in which the average catch rates are considered representative and then to produce overall mean CPUE weighted by the size of these areas. It was not possible to be prescriptive in the approach to be used but rather than different weighting schemes be investigated for their impact on the assessment

- It is recommended that an area weighting scheme be applied to the CPUE data and used in an exploratory VPA calibration; this could be compared to the current catch weighting to evaluate the VPA's sensitivity to different weighting schemes

It was agreed that the trends of all indices should be plotted together and presented on a routine basis in the assessment.

- It is recommended that the aggregated CPUE, survey and Acoustic indices be included in the assessment on a routine basis

Natural Mortality

The analysis by Cadigan (2003) showed some very interesting trends in natural mortality (M) that differed by whether or not the CPUE series was considered in the model split or combined. When the CPUE series was split, M exhibited no trend and just considerable variation. A combined series showed significant trends in M, although it was unclear whether these were real or an artifact. Overall, it was felt that the trends in M appeared to be a function of the treatment of the CPUE.

This led to a discussion on what trends in M could be expected with the observed seal consumption rates. The sense was that with seal consumption of 20kt (spring + fall) compared to an overall stock biomass of 400kt, it would be difficult to detect changes in M.

- It is recommended to include with the assessment some basic calculations on how many tons of herring would be associated with a M change of 0.01

Gillnet Catchability

Spring Assessment

The treatment of the CPUE series in the spring component assessment was not examined as this assessment had not exhibited a retrospective problem. The only point raised was that comment in the upcoming assessment should be made on the temporal stability of the use of various mesh sizes.

Fall Assessment

As reported above, in the analysis of Cadigan (2003), use of a split CPUE series by mesh size produced a strong retrospective pattern, as per the 2002 assessment. However, when the large and small mesh gillnet CPUE series were incorporated into the VPA as one series, the retrospective pattern was significantly reduced, indeed to a tolerable level. Here, small mesh gillnets implied a mesh size of 2 5/8 in while large mesh implied predominantly 2 ¾ in. mesh and a small amount of 2 7/8 in. mesh. The model used an assumed large / small mesh gear ratio by age. It was evident from the analyses that allowing the model to estimate these ratios was not possible as these were confounded with other processes. External information on these ratios was needed to allow the model to estimate catchability. Ratio information available from catchability experiments should be used directly in the model.

Cadigan's (2003) application was developed using computer software different from that being used in the GFC. To ensure that the GFC application is correctly employing the model framework suggested at the meeting, it was suggested that the model output of Cadigan (2003) to used to corroborate the veracity of the modified GFC ADAPT application.

There was discussion of potential inclusion in the assessment model of a non-linear relationship between gillnet catch rate and abundance, to account for gear saturation effects. It was reported that in the fall, about 70% of the fleet reports the presence of a saturation effect. This stimulated discussion on what are the underlying processes governing this relationship. It was considered that before adopting a non-linear, saturation, model, a more complete understanding of the processes was required. This implied the collection of more complete effort (searching, fishing and traveling time) information that is being collected via the telephone survey but could be collected through the DMP program.

- It is recommended that the underlying process governing the relationship between CPUE and abundance be investigated, including enhancement of effort data collection via the DMP

For the upcoming RAP meeting, it was suggested that the potential presence of saturation be examined. This could involve examination of per net catch rates as

a function of time. In addition, it would be worthwhile to see if this effect has changed over time.

- It is recommended that the potential presence of gillnet saturation be examined in the upcoming RAP meeting of the fall spawning component

Until a more complete understanding of the gear saturation effect is developed, it was agreed that the assessment employ a linear relationship between gillnet CPUE and abundance. It was noted that this represents a more conservative approach than assuming a non-linear model, another argument supporting the linear model.

There was discussion on the calculation of terminal year abundance for ages 2 - 4, those outside of the calibration block. In previous assessments, it was stated that abundance at these ages had been based on the geometric mean of some historical period. A more appropriate approach, used in other age-based assessments, is to calculate partial recruitment for these ages based on some historical period. Along with the assumed fishing mortality and the catch at these ages in the terminal year, abundance could be derived. It was seen as the preferred calculation method for these age groups.

Summary

Spring Assessment

The formulation for the spring spawning component is given in appendix 4a. This is very similar to the formulation used in the 2002 assessment. The only significant issue remaining to be addressed during the upcoming RAP meeting was the impact of the 1994 acoustic survey data and age four information on the assessment.

Fall Assessment

The formulation for the fall spawning component is given in appendix 4b. This incorporates the changes suggested above involving the fishing mortality on the oldest age, the treatment of the gillnet CPUE and the calculation of abundance of age 2 - 4 herring in the terminal year.

There was discussion on whether or not the results of the VPA, including the risk analysis for upcoming yield, were credible, notwithstanding the suggested changes. It was expected that routine diagnostics of residual trends would be produced and be examined at the RAP meeting. In addition, it was suggested that qualitative indicators of stock status (condition, growth, spatial extent, phone survey of abundance, etc) be reported to corroborate the results of the VPA.

DECISION RULES

This section is based upon discussion led by R. Claytor during the Wednesday morning of the meeting.

Three topics were covered: data collection requirements for fall fisheries on spawning grounds, spring inshore fisheries, and how this information would affect the scientific advice.

Fall Data Collection

- Experimental gillnets should be fished each night that acoustic data is collected.
- A local person would be hired by each port to sample the experimental nets and commercial fishery catch each day that acoustic data is collected. The objective is to obtain simultaneous acoustic, experimental, and commercial data to improve the data analysis.
- Local herring associations are to provide funding for hiring someone to accomplish the sampling and downloading of acoustic data.
- Science intern programs are to be used to obtain people to work in the lab at the Gulf Region office to process the extra samples that would be collected.
- Experimental nets should be standardized among the areas participating in projects.
- A logbook or dockside monitoring program should be used to obtain information on number of nets used by individual fishers each night and corresponding catch and GPS or other geo-referenced position data on catch location. This is to check to determine if the acoustic data has covered all schools and to assist in analysis of the effects of saturation on catch rate analyses.
- The occurrence of spawning events should be noted by wharf monitor or by some other person to assist in interpreting acoustic data trends.
- This extensive data collection would be attempted as part of Pictou and Fisherman's Bank projects for the fall of 2003.

Spring Acoustic Data Collection

- Acoustic data collection by fishers as done in the fall does not seem to be applicable to spring fisheries.
- Detailed data collection on location of spring nets and catch by net would be useful in improving the spring herring assessment.
- This data collection could be accomplished by logbooks or dockside programs.

Scientific Advice

- The expectation of participating groups is that they would be able to fish what the population can support. There was recognition that this would mean increases in some years and decreases in other years, but the ups and downs would not be dependent on unrelated fisheries.
- The analytical method must be reviewed at a RAP or workshop before it can be incorporated into the assessment.
- Once the methodology is accepted, management, industry, and science will need to have discussions concerning how local advice is to be integrated into the overall assessment. This will be particularly important if only some groups participate in local acoustic projects.

CONCLUDING REMARKS

The meeting provided an opportunity to undertake an in-depth examination of the assessment models of the spring and fall spawning components of herring in the Gulf of St. Lawrence. Focus was on the fall spawner model as this had exhibited a severe retrospective problem during the 2002 assessment. A number of modifications to the VPA formulation were suggested that would lead to a significant reduction in the retrospective problem. In addition, a number of suggestions were made to enhance the treatment of the data input to the VPA. Not all issues could be resolved at the meeting and would have to be considered at the upcoming RAP meeting. Overall, however, the meeting was successful in producing a VPA formulation that was a more appropriate basis of harvest advice than the existing one.

REFERENCES

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Morin, R. 2002. Proceedings of the Regional Advisory Process on the Status of Herring in NAFO Divs. 4T and 4VWX. CSAS Proceedings Series. 2002/017.

Sinclair, A., D. Gascon, R. O'Boyle, D. Rivard and S. Gavaris. 1991. Consistency of Some Northwest Atlantic Groundfish Stock Assessments. NAFO Sci. Coun. Studies. 16: 59 – 77.

Appendix 1. List of Participants.

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Ted Williston	MFU, New Brunswick	(506) 228-4670		

Appendix 2. Invite Package

Fisheries and Oceans Pêches et Océans
Maritime Provinces Regional Advisory Process (RAP) Office
Fisheries & Oceans Canada
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Dartmouth, Nova Scotia B2Y 4A2
(TEL: 902 426-7070)
(FAX: 902 426-5435)

Bureau du Processus consultatif régional (PCR) des provinces
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Pêches et Océans Canada
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Dartmouth (Nouvelle-Écosse) B2Y 4A2
(TÉL. : 902 426-7070)
(FAX : 902 426-5435)

5 March 2003

Dear Participant,

You are invited to attend the next meeting of the Regional Advisory Process (RAP), 18-19 March 2003, to develop an assessment framework for herring in the southern Gulf of St. Lawrence (NAFO Div. 4T). Note that this meeting will not be considering the state of the 2003 fishery. This will occur at a RAP meeting during 25-27 March 2003 in Halifax. Rather, this meeting will be an in-depth review of the assessment model to be used later in March.

I will be chairing the meeting. The meeting will be conducted in the Miramichi Boardrooms 2 & 3 at the Gulf Fisheries Centre in Moncton, NB.

The remit for the meeting is attached. I would appreciate if you could confirm your attendance with Denise LeBlanc at (506) 851-6253 no later than March 12th.

Yours sincerely,

Le 5 mars 2003

Madame, Monsieur,

La présente a pour but de vous inviter à assister, les 18 et 19 mars 2003, à la prochaine réunion du Processus consultatif régional (PCR), visant à élaborer un cadre d'évaluation du hareng du sud du golfe du Saint-Laurent (div. 4T de l'OPANO). À noter qu'il ne s'agira pas d'examiner l'état de la pêche en 2003 à cette occasion. Cela sera fait à une autre réunion du PCR, qui aura lieu du 25 au 27 mars 2003 à Halifax. La réunion servira plutôt à effectuer un examen approfondi du modèle d'évaluation devant être utilisé plus tard en mars.

La réunion en question, qui sera présidée par moi-meme, aura lieu dans les salles de conférences Miramichi 2 et 3, au Centre des pêches du Golfe, à Moncton (N.-B.)

Vous trouverez ci-jointe la demande de renvoi à la réunion. Je sous serais reconnaissant de bien vouloir confirmer votre présence en communiquant avec Denise Leblanc, au (506) 851-6253, au plus tard le 12 mars.

Je vous prie d'agréer, Madame ou Monsieur, mes meilleures salutations,

Original signed by / Signataire de l'original

Robert N. O'Boyle
RAP Coordinator / Coordonnateur du PCR

Cc: D. LeBlanc

Distribution:

Chairs / Présidents

Robert O'Boyle

DFO Maritimes and Gulf Regions / Régions des Maritimes et Golfe, MPO

Mike Chadwick
Ghislain Chouinard
Kirsten Clark
Jean-Maurice Coutu
Jack Fife
Alain Hébert
Marc Lanteigne
Claude LeBlanc
Gary Melvin
Gloria Poirier
Mike Power
Denis Rivard
Rob Stephenson
RAP Coordination Committee

Invited Reviewers / Examinateurs invités

Robert Mohn
Ross Claytor
Ian McQuinn
Noel Cadigan

Provincial / Provincial

Mario Gaudet
Dave MacEwen
Dario Lemelin
Alan Chandler

Industry / Industrie

Robert Haché
Jean-François Martel
Ken Campbell
Greg Egilsson
Réginald Comeau
Edmond Drisdele
Leonard Poirier

Regional Advisory Process on 4T Herring Assessment Framework

18 – 19 March 2003
Miramichi Boardrooms 2 & 3
Gulf Fisheries Centre

Réunion du Processus consultatif régional portant sur le cadre d'évaluation du hareng de 4T

Les 18 et 19 mars 2003
Salles de conférences
Miramichi 2 et 3
Centre des pêches du Golfe

Remit

Demande de renvoi

Background

Since 1977, herring in the Gulf of St. Lawrence (4T) has been assessed as a spring and fall spawning component, with Virtual Population Analysis being the main analytical tool. At the March 2002 RAP, the spring spawning component VPA was calibrated with a combination of gillnet catch rates and acoustic survey indices. The model appeared to be behaving adequately. For the fall spawning component, there was little correspondence between the gillnet catch rates and the acoustic indices and thus the VPA was calibrated solely with the gillnet catch rates. A large retrospective pattern was observed, which invalidated use of the VPA results as the basis for advice formulation. Advice had to be based upon a combination of catch rate – derived estimates of total mortality and general observations from the fishery.

The Maritimes RAP has adopted an approach to assessments that calls for a separation of the review of the assessment framework from the application of the framework to data as part of the annual fisheries management planning cycle. The topics to be considered in a framework review range from the definition of the management unit, through to the processes governing the productivity of the resource (see framework theme below).

Given the problems observed in the 4T herring assessment models, the resource was chosen to undergo a focused review of the assessment framework prior to March 2003.

Renseignements de base

Depuis 1977, le hareng du Golfe du Saint-Laurent est évalué en deux composantes : celle des reproducteurs de printemps et celle des reproducteurs d'automne, essentiellement au moyen d'une analyse de population virtuelle (APV). À la réunion du PCR de mars 2002, l'APV de la composante de reproducteurs de printemps a été étalonnée d'après une combinaison des taux de prises au filet maillant et des indices de relevés acoustiques. Le comportement du modèle semblait satisfaisant. Dans le cas des reproducteurs d'automne, il y avait peu de correspondance entre les taux de prises au filet maillant et les indices acoustiques; l'APV a donc été étalonnée seulement d'après les taux de prises au filet maillant. En raison de la forte tendance rétrospective observée, on n'a pu se fier aux résultats de l'APV pour formuler un avis. Celui-ci a dû être fondé sur une combinaison des taux de prises et des estimations connexes de la mortalité totale, ainsi que sur des observations générales provenant de la pêche.

Dans le cadre du PCR des provinces Maritimes, il a été décidé de séparer l'examen du cadre d'évaluation de l'application de ce cadre aux données dans le cycle de planification de la gestion des pêches. Les sujets à considérer dans un examen du cadre d'évaluation vont de la définition de l'unité de gestion aux processus qui régissent la productivité de la ressource (voir les objectifs ci-dessous).

Compte tenu des problèmes observés dans les modèles d'évaluation du hareng de 4T, on a décidé de soumettre la ressource à un examen approfondi du cadre d'évaluation avant mars 2003.

Objectives

Estimation of Current State of the Stock

- Review the input data (catch-at-age, construction and coherence of abundance indices, etc) and the methods used for the calculations; identify analyses to be conducted for the next assessment and those to be included in 2002-2003 workplans.
- Explore the structure of the model and assumptions of the ADAPT formulation, review diagnostics and examine potential improvements.
- If necessary, propose alternative/ complementary methods for the assessment of herring.

Guidance on Activities

- Define the agreed assessment framework for 4T herring to be used in March 2003 RAP

Products

A Proceedings document will be produced, which will document the details of the 4T herring assessment framework and summarize the discussion of the meeting.

Research documents as defined by the RAP

Participation

Participation will be solicited from the following:

- DFO Science & Fisheries Management
- FRCC
- Industry
- External Reviewers

Objectifs

Estimation de l'état actuel du stock

- Revoir les données d'entrée (prises selon l'âge, élaboration et cohérence des indices d'abondance, etc.) et les méthodes de calcul utilisées; déterminer quelles sont les analyses à effectuer dans la prochaine évaluation et celles qui sont à inclure dans les plans de travail de 2002-2003.
- Explorer la structure du modèle et les hypothèses liées à l'utilisation du logiciel ADAPT, revoir les diagnostiques et examiner les améliorations possibles.
- Si nécessaire, proposer des solutions de rechange et des méthodes complémentaires pour l'évaluation du hareng.

Orientation des activités

- Définir le cadre d'évaluation du hareng de 4T qu'il sera convenu d'utiliser à la réunion du PCR de mars 2003.

Produits

Compte rendu documentant de façon détaillée le cadre d'évaluation du hareng de 4T et résumant les discussions tenues lors de la réunion

Documents de recherche définis par le PCR

Participation

On sollicitera la participation des organismes suivants :

- MPO – Sciences et Gestion des pêches
- CCRH
- Industrie
- Examinateurs externes

Regional Advisory Process
On 4T Herring Assessment Framework
18 – 19 March 2003
Miramichi Boardrooms 2 & 3
Gulf Fisheries Centre

Agenda

Tuesday, 18 March 2003

09:00 Introduction (O'Boyle)

09:30 Review of Problems encountered in Spring 2002 Assessment & Recommendations made (LeBlanc & Poirier)

10:00 Break

10:30 Review of Potential Causes of Retrospective Pattern (LeBlanc & Poirier)
- Catch at Age
- Model Errors
- Natural Mortality
- Other

12:00 Lunch

13:00 Review of Abundance Indicators Used in Assessment (LeBlanc & Poirier)

- Commercial CPUE at Age
- Acoustic Survey at Age
- Groundfish Survey

15:00 Break

15:30-17:00 Presentation & Discussion on Preliminary Analyses to Resolve Retrospective (LeBlanc & Poirier)

Evening Work Assignments

Wednesday, 19 March 2003

09:00-12:00 Work Assignments

12:00 Lunch

13:00-16:00 Presentation & Discussion on Analyses to Resolve Retrospective & Recommendations for 26 – 28 March 2003 RAP

Réunion du Processus consultatif régional
sur le cadre d'évaluation du hareng de 4T
les 18 et 19 mars 2003
Salles de conférences Miramichi 2 et 3
Centre des pêches du Golfe

Ordre du jour

Le mardi 18 mars 2003

9 h Introduction (O'Boyle)

9 h 30 Examen des problèmes rencontrés dans l'évaluation du printemps 2002 et des recommandations (LeBlanc et Poirier)

10 h Pause

10 h 30 Examen des causes possibles de la tendance rétrospective (LeBlanc et Poirier)
- Prises selon l'âge
- Erreurs du modèle
- Mortalité naturelle
- Autres

12 h Déjeuner

13 h Examen des indicateurs d'abondance utilisés dans l'évaluation (LeBlanc et Poirier)
- PUE commerciales selon l'âge
- Relevé acoustique selon l'âge
- Relevé sur le poisson de fond

15 h Pause

15 h 30 – 17 h Présentation et discussion sur les analyses préliminaires en vue de résoudre la tendance rétrospective (LeBlanc et Poirier)

Travaux attribués pour la soirée

Le mercredi 19 mars 2003

9 h – 12 h Travaux attribués

12 h Déjeuner

13 h – 16 h Présentation et discussion sur les analyses en vue de résoudre la tendance rétrospective (LeBlanc et Poirier), et recommandations pour la réunion du PCR du 26 au 28 mars 2003.

APPENDIX 3. List of Documents

Cadigan, N.G. 2003. Diagnostics for the Retrospective Problem in the 4T Fall Herring SPA. RAP Working Paper 2003/06.

Claytor, R., C. LeBlanc, and A. Clay. 2003. Using Acoustic Indices of Proven Stocks and Decision Rules for Herring Fisheries Management. RAP Working Paper 2003/02.

LeBlanc, C.H., C. MacDougall, and G.A. Poirier. 2003. Review of 4T Herring Assessment Framework, March 2003. RAP Working Paper 2003/01.

APPENDIX 4. Formulations of the Virtual Population Analyses

a. Spring Spawning Component VPA Formulation

Parameters:

Terminal Year N estimates:

$N_{i,2003}$, i = 4 to 11

Terminal Age (10) N estimates:

$N_{10,y}$, y = 2000 - 2002

Calibration coefficients:

Gillnet CPUE ages 4 to 10
Acoustic index ages 3 to 8

Structure Imposed:

Error in catch at age assumed negligible
$PR_{2\&3}$ in terminal year based on average of 19xx-yy
F_{11} calculated as a proportion of F_{10} using FIRST method (Gavaris, 1999)
F_{10} = average (F_8+F_9)
M=0.2

Input:

C_{ik} i=2 to 10, 11+, k = 1978-2002
Gillnet CPUE index $_{ik}$, i=4 to 10, k = 1990-2002
Acoustic index $_{ik}$, i=3 to 8, k = 1994-2002

Objective function:

Minimise sum of squared log normal residuals

Summary:

Number of observations: 145
Number of Parameters: 21

b. Fall Spawning Component VPA Formulation

Parameters

Terminal N estimates:

$N_{i,2003}$, i = 5 to 11

Calibration coefficients:

Gillnet CPUE ages 4 to 10

Structure Imposed:

Error in catch at age assumed negligible
$PR_{2 \& 3}$ in terminal year based on average of 19xx-yy
F_{11} using FIRST method (Gavaris, 1999)
F_{10} = average (F_8+F_9)
M=0.2

Input:

C_{ik} i = 2 to 10, 11+, k =1978-2002
Gillnet CPUE index $_{ik}$, i = 4 to 10, k = 1978-2002

Objective function:

Minimise sum of squared log normal residuals

Summary:

Number of observations: 175
Number of Parameters: 7