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Proceedings of the Science Regional Advisory Process (RAP) on Assessment Framework for Newfoundland East and South Coast Herring

November 25-27, 2009
Comfort Inn Airport
106 Airport Road
St. John's, NL

Meeting Chairperson
E. Dawe

Compte rendu de la réunion du Processus de consultation scientifique régional (PCSR) sur le cadre d'évaluation du hareng des côtes est et sud de Terre-Neuve

Du 25 au 27 novembre 2009
Comfort Inn Airport
106, Airport Road
St. John's, T.-N.-L.

Président de réunion
E. Dawe

Fisheries and Oceans Canada / Pêches et Océans Canada
Science Branch / Direction des science
80 East White Hills Road
St. John's NL / St. John's, T.N.L.
A1C 5X1

April 2010 | **Avril 2010**

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings 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.

This workshop was not carried out as a formal Fisheries and Oceans Canada (DFO) Science Advisory process; however, it is being documented in the Canadian Science Advisory Secretariat's (CSAS) Proceedings series as it presents some topics of interest related to the advisory process.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenus dans le présent rapport puissent être inexacts ou propres à induire en erreur, ils sont quand même reproduits aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considéré en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

Le présent atelier n'a pas été tenu dans le cadre officiel du processus des avis scientifiques du ministère des Pêches et des Océans (MPO). Celui-ci est toutefois documenté dans la série des comptes rendus du Secrétariat canadien de consultation scientifique (SCCS), car il couvre certains sujets en lien avec le processus des avis.

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SUMMARY

During November 25-27, 2009, DFO Newfoundland and Labrador Region reviewed the current state of scientific knowledge of the population dynamics of Newfoundland east and south coast herring and provided a framework to assess these stocks for a five-year period from 2010 to 2014. The review was timed to coincide with the release of recommendations by the Fisheries Resource Conservation Council in their report titled: "Fishing into the future: the herring fishery in eastern Canada". During the review, the following components were examined: stock structure; commercial catch data; commercial sampling protocols; aging protocols; growth and maturation; indices of abundance and models to assess stock status as described in a detailed herring working paper. In addition, the Precautionary Approach and Ecosystem Approach to Fisheries were briefly discussed. Summaries of all these topics and the ensuing discussions are provided. Throughout the review, research recommendations were made to improve the framework. These are recorded in this Proceedings document for later discussion and prioritization.

Also included are the remit and terms of reference, a list of participants, and a list of working papers. Additional information on the resources reviewed and assessed is available in the resulting Science Advisory Report (SAR) and a subsequent research document provided in the CSAS Research Document Series.

SOMMAIRE

Du 25 au 27 novembre 2009, la Région de Terre-Neuve et du Labrador a passé en revue l'état actuel des connaissances scientifiques concernant la dynamique des populations de hareng des côtes est et sud de Terre-Neuve et a élaboré un cadre pour l'évaluation de ces stocks sur une période de cinq ans, soit de 2010 à 2014. On a fait en sorte que l'examen coïncide avec la diffusion des recommandations du Conseil pour la conservation des ressources halieutiques, dans le rapport intitulé : « L'avenir de la pêche : le hareng dans l'est du Canada ». On a examiné les points suivants : structure du stock; données sur les prises des pêches commerciales; protocoles d'échantillonnage des pêches commerciales; protocoles de détermination de l'âge; croissance et maturation; indices de l'abondance et modèles pour évaluer l'état du stock, tels que décrits dans un document de travail exhaustif sur le hareng. On a également tenu de brèves discussions sur l'approche de précaution et sur l'approche écosystémique appliquée aux pêches. Le présent document comprend des résumés sur chaque sujet ainsi que les discussions qui ont suivi. Tout au long de la réunion, on a formulé des recommandations en matière de recherche afin d'améliorer le cadre. Ces recommandations sont incluses dans le présent compte rendu à des fins de discussion et de priorisation.

Le présent document comprend également le cadre de référence, la liste des participants ainsi que la liste des documents de travail. De l'information supplémentaire sur les ressources examinées et évaluées est disponible dans l'avis scientifique (AS) formulé ainsi que dans un document de recherche qui sera publié ultérieurement dans la série des documents de recherche du SCCS.

INTRODUCTION

A meeting of the Regional Advisory Process was held from November 25-27, 2009 at Comfort Inn Airport, 106 Airport Road, St. John's, NL. The Chairman (E. Dawe) opened the meeting and welcomed participants. He described the Framework plan for the meeting after which participants introduced themselves and their respective affiliations prior to the adoption of the agenda. Only one Working Paper was available to the meeting but encompassed a review and analysis of all topics pertinent to the agenda. The senior author (J. Wheeler) introduced the paperwork and documentation and outlined the purpose of the meeting.

The purpose of the meeting was two-fold: 1) to review the current state of scientific knowledge on the population dynamics of the Newfoundland East and South Coast Herring stocks and to provide a framework to assess the stocks for a five year period from 2010-2014, and 2) to assess the status of the stocks in support of the management of the 2010 and 2011 fisheries. Participants included DFO scientists, fisheries managers, and representatives from the provincial government, Memorial University, the Marine Institute and the Fish Food and Allied Workers Union.

WORKING PAPER SUMMARIES, RELATED DISCUSSIONS AND RECOMMENDATIONS

Working Paper 1: An assessment framework and review of Newfoundland east and south coast herring stocks to the spring of 2009. J.P Wheeler, B. Squired and P. Williams.

Stock Structure

Five stock complexes have been identified and used for management purposes as follows:

1. White Bay – Notre Dame Bay
2. Bonavista Bay – Trinity Bay
3. Conception Bay – Southern Shore
4. St. Mary's Bay – Placentia Bay
5. Fortune Bay

These were primarily identified from tagging studies conducted in the late 1970s. Spring spawners dominated in most areas and populations were most discrete during the spring spawning season. A high degree of homing was observed where greater than 75% of herring returned to the same area to spawn in successive years. Northward feeding migrations in the summer with substantial intermixing of local populations within the bays occurring during the summer and early fall while southward migration occurred in the fall to overwintering areas. Although stock complexes were defined for fisheries management, multiple spawning populations comprised each stock complex.

Discussion

It was queried whether in recent years there has been a shift in abundance from spring to autumn spawning components. It was responded that while there has been a shift it is unclear if it is a result of now fewer spring spawners or whether spring spawning has become later in the year giving the impression of more autumn spawning thus skewing the spawning proportions. It was further noted that the tagging results and stock definition as it stands is in accordance with the time of the fishery. However, abundance indices from which the

speculations on shifts are being made are estimated at a different time of year and may therefore be confounded by temporal differences.

It was noted nevertheless, that there have been significant changes in the stock distribution and abundance that warrants a review of current stock structures and that traditional methods for studying stock structure may need to change given current fishing practices, reduced fishing effort and much reduced population sizes. A general exchange of perspectives ensued regarding usefulness, practicality and cost associated with past and current stock identification methods such as, various tagging techniques, genetics (DNA markers), trace elements, meristics and morphometrics and parasites. In addition, some discussion took place on the potential effects of environmental changes on perceived variances in stock structure.

Research Recommendations

1. Consideration should be given to re-examining stock relationships. Of particular concern is the degree of discreteness between spring and autumn spawning components, especially in White Bay-Notre Dame Bay and Bonavista Bay-Trinity Bay stock areas.

2. Traditional tagging experiments may no longer be practical, mainly due to low levels of fishing effort. Alternative approaches should be considered.
   - Genetic markers
   - Trace element analysis
   - Acoustic tags

3. Investigate fully the apparent shift in dominance from spring spawners to autumn spawners in the two northern stock areas to determine the nature of the change, its cause, and implications for the ecosystem and for fisheries management.

Commercial Catch Data

Policy and Economics Branch provides commercial landings data (t), by bay, month, and gear type as derived from dockside monitoring, hails, logbooks and purchase slips. Bait catches were included during 1970 to 1995 but not since 1995 and it is uncertain if bait catches were included in the catch statistics prior to 1970.

Estimation of Herring Caught for Bait (in the Lobster Fishery)

Mean bait catches per fisher from 2007 and 2008 telephone surveys were used to estimate bait catches by area from 1996 to 2006 for herring used as bait in the lobster fishery. The number of active lobster fishers was available, by lobster fishing area and year, for the period from 1998 to 2006 and with few exceptions, lobster pot restrictions have remained constant in all areas since 1998. Total bait estimates from 1998 were applied to 1996 and 1997. Annual estimates of total bait (1996 – 2006) were available by stock area only (WB-NDB, BB-TB, SMB-PB, FB) and these were added to the annual gill net landings in May in NDB, TB, PB, and FB. The selection of month was logical as most lobster landings occur in May although the selection of the bay to which bait estimates were added was somewhat arbitrary. It was assumed that the 2007 and 2008 bait estimates are accurate; that the duration of the lobster fishery was constant, in each area, over the time period (1996 – 2008); that herring were available consistently through the time period and that the catch of all lobster fishers is recorded.

Discussion

Most of the discussion regarding bait catch estimates centered on the difficulties in getting accurate estimates. It was noted, for example, that 95% of fishers in the gillnet fishery fish for bait but that bait is not recorded in the official catch statistics; violations in the basic assumptions might alter the estimations considerably. Also, although fishermen usually caught their own herring for bait quite often now some is sold and later bought back from the processing plants for use in crab fisheries resulting in potential double counting of bait catch. It was indicated that the provincial government recently instituted a pilot study on using equal amounts of herring and squid as bait requirements in the crab fishery; if successful could be influential in future bait capture and estimation under current assumptions. It was suggested that data from a detailed logbook study, including bait catches, by DFO Fisheries Management in NAFO Division 3K could be made available and may be useful to ground truth some of the estimation procedures and assumptions currently used.

Research Recommendations

1. Use the calculated estimates for 1996 – 2006; use telephone survey estimates from 2006 onward, until better estimates are available.

2. Test to see the impact of using mean bait estimates from more telephone surveys, as they become available. For example, if a three year average (2007 – 2009) had been used, bait estimates would have been within 10% of those derived using the two year average.

3. Use information from the 2007 – 2009 telephone surveys to re-examine the calculated estimates for 1996 – 2006 in an attempt to account for lobster fishers who purchased bait rather than fished for bait themselves.

Estimation of Herring Discarded Dead in the Herring Fishery

Estimates of dead discards are available from purse seines only, from 1996 to 2008 where purse seines have accounted for approximately 40% of reported landings during this period. Data are available from an annual telephone survey of purse seine fishers comprising 87% of active fishers interviewed over a 13 year time series. Estimates of total landings, total discards, and discard survival rates are provided to calculate an annual removal to landing ratio ranging from 1.00 to 2.37, with a mean of 1.10. Annual purse seine catch has been estimated by applying the annual ratio, by stock area, to reported monthly purse seine landings within the area assuming that the estimate of total discards is accurate and that the estimate of discard mortality is accurate.

Discussion

It was stated that the major reasons for herring discards in the herring fishery have been primarily due to the implementation of trip limits and/or a preponderance of undersized fish. However, fishermen at the meeting indicated that the proportions of discarding in the purse seine fishery have been declining in recent years as a result of improved fishing practices in the interest of conservation.

Research Recommendations

1. The estimation of dead discards is difficult for fishers to quantify and difficult for anyone else to verify. Given that the average rate of dead discards in the purse seine fishery is 10%, and given that it is for part of the time series for one gear only, this correction should not be made.

2. Continue to collect discard information for the purse seine fishery and any other fishery for which discard information is available.

Estimation of Herring Caught as By-Catch in Other Fisheries

Herring are caught as by catch in other fisheries most particularly Capelin (purse seine, tuck seine, trap) and Mackerel (purse seine, tuck seine, bar seine, trap) but are also caught by Shrimp trawls, Squid traps and Cod gill nets. Herring by catch is recorded by Policy and Economics only if it provided on dockside monitoring forms or on purchase slips for those fisheries not covered by DMP. Estimates of herring by catch are available in a Science capelin logbook data base from 1981 to 1999; however, these data have not been evaluated.

Discussion

It was indicated that there are many cases where herring is taken in significant quantities in non-purse seine pelagic fishing gears and are most often discarded without being recorded. This is especially so in the capelin and mackerel fisheries. There were several comments noting that when herring and mackerel are caught together the catch is often sold as mackerel only which results in under-reporting of the herring removals (and of course the over-reporting of the mackerel catch). There were also a variety of views that indicate that discarding trends likely have changed over time due to changing fishing practices, management regulations and market requirements. It was noted further the importance of this given that discard proportions have been assumed to be rather static over time when the data are introduced into analytical models.

Research Recommendations

1. Investigate new information sources that may now be available containing herring discard and by-catch data and evaluate their potential for providing more precise catch data on herring removals.

Estimation of Other Species Caught as By-Catch in Herring Fisheries

Commercial species caught as by-catch in herring fisheries are mainly mackerel, cod, salmon and various flounder species. Catches of these species are recorded by Policy and Economics only if it provided on dockside monitoring forms or on purchase slips for those fisheries not covered by DMP.

Research Recommendations

1. Estimates of the by-catch of other species in herring gill nets are available in the herring research gill net data base since 1982. Although this information is not required to estimate herring abundance, it should be evaluated to address by-catch issues..

Commercial Sampling Protocols

Biological samples are collected annually from random samples of commercial landings. The protocol is to collect one random sample per 500 t of landings, by gear type, by month, and by bay (WB, NDB, BB, TB, SMB, PB, FB). A sample consists of 50 fish collected by Pelagic Section personnel from a variety of sources, primarily fish processors and fishers. Samples are frozen and returned to NAFC for processing. All specimens that are sampled are aged. The following parameters are recorded for each of the 50 fish within a sample: Age, spawning type, and mean whole weight which are used to construct annual catch-at-age vectors by spawning type and stock area. Normally samples are available from major fisheries, but sometimes not from smaller fisheries. On average, samples are available for > 80% of reported landings. If a sample is not available for a (gear, month, bay) cell, another sample must be applied, using the following criteria:

1) Same gear, same season, same bay
2) Similar gear, same season, same bay
3) Same or similar gear, different season, same bay
4) Same or similar gear, same season, different bay
5) Same or similar gear, different season, different bay

When a sample is applied to more than the cell from which it was collected, it assumes that the age composition and spawning type composition of the sample is representative of all cells to which it is applied. Catch-at-age matrices from 1996 to 2008 have been revised to account for herring discards in the purse seine fishery and herring used as bait. By adding the bait estimates to the May gill net landings in one bay (of two bay stock areas), it assumes that the sample applied to that landing applies to the entire stock area.

Discussion

Most of the discussion centered around points of clarification with respect to sampling procedures and more particularly, how sampling was prioritized when resources were limited. For example, it was considered by the researchers to be more important to secure samples within Bays because of small catches than across Bays although statistical testing has never been carried out to evaluate for significant differences.

Some discussion ensued around the pros and cons of random versus stratified-random sampling procedures and whether or not the sampling design is predicated on getting a statistically satisfactory length frequency distribution or age frequency distribution. The adequacy of sample sizes with respect to catch levels was also questioned. No conclusions were reached at this time.

Research recommendations

1. Evaluate the strengths and weaknesses of random versus stratified-random sampling design with respect to collection of age and length samples for herring.

2. Evaluate the minimum sampling requirements for herring with emphasis on the number of samples per ton of catch as well as the number of fish per sample. The practicality of collection within human resource constraints should also be taken into account.

Ageing Protocols

Newfoundland herring otolith collections date back to 1966. There have been only three principal age readers during that time period each over lapping his predecessor to allow for transfer of technical know how. All herring that are sampled are aged; in 2008, 5380 specimens were sampled and aged.

Ages are assigned by examining the formation of annuli on the otolith. Age is determined by counting the number of summer rings on the rostrum area; it is sometimes necessary to count rings on two or more areas of the otolith. Every effort is made to exclude the fish length when determining ages. Similarly, comparisons with samples from the previous year are avoided until the reading of otoliths for a particular stock area is complete.

Spawning type is assigned based upon a combination of age, maturity stage, otolith characteristics, and season of capture. Spring-spawner otoliths have small, white, opaque, convex nuclei. Mature spring spawners, caught from April through June, would normally be maturity stages 4, 5, or 6 with gonads of 70 – 80 grams; they may also be maturity stages 7 or 8. Autumn-spawner otoliths have larger, translucent, concave nuclei. Mature autumn spawners, caught from July through October, would normally be maturity stages 4, 5, or 6 with gonads of 70 – 80 grams; they may also be maturity stages 7 or 8.

Discussion

It was explained that in NAFO Div. 4VnWX where statistical testing has been carried out, age reading errors in herring are very problematic and are causing substantial variances in stock assessments. It is suggested therefore that some quality control exercises are essential to fully evaluate the potential effects of age reading errors in providing assessment advice in Newfoundland herring stocks. Re-reading samples and testing for error distributions are rather simple but highly useful techniques and could be applied; computer software for examining such data also is now readily available. It was also suggested that a reference otolith collection be developed within the region to be used to train new age readers and ensure consistency over time.

Research Recommendations

1) Quality control exercises should be implemented (eg. re-reading samples) and statistically analyzed to examine for errors and their potential effects on stock assessment advice.

2) A reference digitized collection of otoliths should be established.

3) A second age reader should be trained within the Pelagic Section to read herring otoliths

Growth and Maturation

Maturation age and size of spring spawning herring decreased substantially in the late 1980s, approximately a decade after a precipitous decline in herring abundance. Length-at-age and body condition decreased concurrently with changes in maturation. These changes supported the hypothesis of evolutionary changes in maturation. However, increases observed in the most recent year classes and concurrent changes in other species suggest that changes in the environment may have also affected age and size at maturation.

Mean weights-at-age are available by stock area and spawning type from 1970 – 2008. Only samples collected from January to June are used to minimize intra-annual growth effects. Samples are derived from both commercial fisheries and research initiatives.

Discussion

A latitudinal cline in weights-at-age was noted for some areas but not in others. Although the reasons for this were not especially clear it was suggested that catching older fish of dominant year-classes where younger fish are less prominent in the catch may contribute to this effect. It was also noted that the individual growth pattern in the first year of life quite often sets the stage for future size at age even though growth rate after the first year may not differ from other year-classes and this too may contribute to such effects. It was also thought that an investigative look at environmental, genetic and density dependent effects on growth and maturation in these stocks would be worthwhile.

Research recommendations

1) Examine changes in the L_{50} and A_{50} with environmental changes using degree days as a proxy for environmental conditions.

2) Examine the impact of combining research and commercial samples on the development of weights-at-age.

Indices of Abundance

Spring and Fall Research Gill Net Catch Rates

The research gill net program consists of five standardized gill net sizes (50.8, 57.2, 65.5. 69.9, 76.2 mm) fished for 45 days approximately the same time each year from a fixed location. The nets are hauled once per day weather permitting with a daily record of catches with numbers recorded by net size and consisting of 12 samples (2 per week; 50 fish per sample; 10 per net, chosen randomly). Samples are frozen and returned to NAFC for processing.
There are a number of concerns associated with the program:
1) Sample sizes per stock area are small (from 4 in FB to 9 in BBTB).
2) Catch rates are likely confounded by systematic changes in growth and maturation rates that have occurred since their inception.
3) Spring research gill net program is designed to catch spring spawning herring at a time when stock mixing (spring and autumn spawners) is minimal.
4) Within the last 3 to 6 years, the percentage of autumn spawners has increased substantially in research gill net and commercial fishery catches in all areas except FB.

Discussion

It was questioned whether or not there was any effort to get information from the winter period. It was responded that this was not done because it would require a complete shift of the time period (spring surveys) and would be tantamount to starting a new series at the expense of discontinuing the long time series given limited research resources. Nevertheless, it was noted that the spring series was expanded by 15 days annually in 2009 in an attempt to capture observed changes in distribution. It did not compromise the long time series because the original time frame was included within the expanded period. Therefore, the data can generate a new index while still maintaining the original series.

It was queried if the two time series (spring and fall) were carried out when spawning components were mixing. It was responded that the surveys were conducted at times when the spring and autumn spawners were least mixed although this may have changed some in recent years. It was further suggested that a standardized mesh size might be more appropriate to simplify the sampling and increase sample sizes, however, it was noted that with changing herring lengths and girths the program should use as many mesh sizes as is practical.

There were several concerns expressed regarding potential bias in estimating catch rates. For example, the timing of the effort expansion during the spring surveys from 30 to 45 days might affect the average catch rates. Also, if the dynamics of the autumn spawning component has changed then combining the spring and autumn spawning indices would bias the overall trend in catch rate. It was agreed that this needs to be investigated and it was suggested that developing a standardized catch rate series to account for these might be warranted. Along this vein it was proposed that an analysis using spring spawner index only versus combined might serve to illustrate any difference in trend.

Research Recommendations

1) It has already been recommended that standardized estimates of year class and year effects be extracted from these data, using statistical models that permit the age - mesh size interaction to be quantified. This has not yet been done.

2) Examine the fall research gill net catch rates (1980 – 1991) for WB-NDB and BB-TB to determine if they can be linked with the spring catch rates (there are four years of overlapping data, 1988 to 1991).

3) Investigate the development of a standardized catch rate series from the data series available in an effort to eliminate potential bias due to the timing in the expansion of the spring series and the effect of the changing dynamics in the autumn spawning component where the spring and fall series are combined.

4) Conduct a comparative analysis of the index of spring spawners only versus the index of spring and autumn spawners to examine for differences in trend.

5) Investigate the possibility of spawning season affinity changeover by examining growth (annulus width) over the first couple of years of life then contrasting early life growth dynamics of spring vs. autumn spawners across time.

6) Explore the possibility of calculating index excluding periods of zero catch (when herring were not yet available in the area).

Biomass Estimates from Acoustic Surveys

There were 32 acoustic surveys for herring carried out between 1983 and 2000. From 1983 to 1986, biomass was estimated from a relationship between school area and school weight whereas from 1987 to 2000, biomass was estimated by echo integration. Both provided absolute estimates of abundance and were used in an attempt to calibrate population abundance models. Acoustic surveys for herring were eliminated in 2000 due to program reductions. One joint Industry / Science survey in selected areas of SMB-PB was conducted in 2005.

The inadequacy of biological sampling during acoustic surveys was a serious concern as it meant that biomass estimates could not reliably be age dis-aggregated and this severely limited the impact of acoustic biomass estimates in calibration of population abundance models. There were always concerns regarding the length-based target strength relationship, especially when biological sampling was poor. During the late 1990s, when stock sizes were small, the variability of acoustic biomass estimates increased, as herring schools were smaller and less likely to be detected acoustically.

Discussion

It was generally agreed that estimating population abundance using acoustic survey technology is the most desirable approach for pelagic, schooling species such as herring. Nevertheless, it was noted that the approach has many difficult technical issues to overcome. It was further noted that low abundance reduces the reliability of stock size indices due to the hit and miss nature of lower stock size. It was pointed out nonetheless, that since the current series was discontinued 9 years ago the technology has much improved especially area coverage capability although appropriate acoustic signal strengths still need to be properly developed for any intended survey. It was indicated that there is a large historic database available from this survey series that could be analyzed to examine for future possibilities.

Most of the discussion was centered on the technical aspects of conducting acoustic surveys such as vessel types, areas, gear types, and timing among others mainly for information gathering purposes but especially types of vessels that could be successfully used to reduce costs. It was reiterated that biological sampling in conjunction with acoustic surveys will always be a major stumbling block although it was suggested that industry vessels may be helpful in support of this aspect of the data collection.

Research Recommendations

1) Acoustic surveys should be re-instated to estimate herring population sizes.

2) The historical acoustic survey data base should be used in the development of survey design.

3) Acoustic surveys must incorporate a reliable biological sampling component as part of the survey design.

4) Surveys conducted through a joint Industry / Science initiative must ensure that the objectives of all parties are addressed.

Gill Net Logbook Catch Rates

The gill net logbook program was initiated in 1996 to provide a time series of standardized catch per unit effort data from the commercial gill net and bait fisheries. Completion of the logbook is voluntary. Logbooks are sent to approximately 2200 licensed fixed gear fishers and bait permit holders although the number of returned logbooks is always very low. In 2009, 37 logbooks were returned; this represented 4% of active fishers even though mid year reminder letters were sent out annually in 2007, 2008, and 2009. Feed back is sent annually to fishers who return logbooks. Overall return rate since 2006 has increased by 20%, however, it still only represents a very small proportion of active fishers.

Discussion

Most concerns expressed were around the low level of returns and whether or not there was any validity to the data trends as a result. It was pointed out that the CPUE trends from this index did track well with some indices but not others. There was a difference of opinion regarding the voluntary aspect of the program. Some felt that a mandatory program would better facilitate higher returns whereas others, especially industry representatives, felt that a mandatory program would likely compromise the quality of the data returned. In this case it was felt a robust communication strategy would better serve increased participation. It was further indicated by DFO fisheries management that as eco-labeling moves forward, mandatory logbooks will become the norm in any event and in that regard there are pilot projects currently in place to develop more user friendly logbooks.

Research Recommendations

1) Science should actively seek fishers within each stock area to increase logbook returns.

2) Logbooks should be designed in collaboration with fishers. For example, the provision of better materials eg. waterproof paper and pens would make it easier for fishers to work with the logbooks and likely result in more interest in providing the data by others.

3) Assuming adequate logbook returns, consideration should be given to adding a sampling component to provide age dis-aggregated catch rates.

4) Information from the logbook mailouts should be evaluated against the telephone survey when there are sufficient years of overlap, ie 5 -7 yrs.

Gill Net Fisher Abundance Index (from Logbooks)

This index is derived from a question on the gill net logbook where fishers are asked to quantify their observations on herring abundance.

A cumulative index is calculated as follows:
1) The 1 to 10 scale of abundance, where 5.5 is average, is converted to a scale of -4.5 to +4.5, where 0.0 is average.
2) A fisher's observation of abundance from year 'n-1' to year 'n' is recorded as a plus or minus on this scale.
3) An average is derived for all fishers from a stock area.
4) This is then added to or subtracted from the previous year's estimate for the stock area.

The main shortcomings of this index is that observational indices require the interpretation and quantification of the term "average" and how this is interpreted by one fisher versus another. In addition, the observational index from gill net logbooks is based upon very small sample sizes.

Discussion

Most of the commentary questioned the usefulness of the data as an index of stock size as a result of the low sample sizes and the subjectivity of the responses. While some felt this data

collection should be discontinued, others felt there may be useful information on the fishery from fishers observations.

Research Recommendations

1) Although this index provides fishers with an opportunity to express their observations of abundance, it is questionable if this index should be continued, especially if sample sizes (returned logbooks) continue to be small.

2) Evaluate the abundance indices between the logbooks and the telephone surveys during a suitable overlap period.

Gill Net Fisher Abundance Index (from phone questionnaires)

This survey was initiated in the fall of 2006 and has been conducted annually since then. Objectives are two-fold: 1) to determine how many herring gill net license and/or bait permit holders fished in the current year, and 2) to obtain observations of herring abundance and other information from those that did. Attempts are made to contact approximately 20% of all license and/or bait permit holders; this is approximately 400 fishers. Response rates over the four year time series have averaged 83%. The surveys have indicated that only 40% - 50% of license and/or bait permit holders fish annually. Of those that do fish, 95% fish for bait only, not for commercial sale. A cumulative index is calculated in the same way as from gill net logbooks. The telephone survey also provides estimates of bait catches and distribution of the fishery.

The same concerns regarding an observational index: require the interpretation and quantification of the term “average” and how this is interpreted by one fisher versus another. Unlike the observational index from gill net logbook survey the telephone survey is based upon large sample sizes.

Discussion

Similar comments as with logbook questionnaire above although the sample sizes are much larger here.

Research Recommendations

Gill net logbooks and phone surveys together provide important and relevant information on the percentage of active fishers, total effort and mesh sizes, distribution of catch and effort in time and space, catches for bait and observations of abundance. In order to reliably estimate these variables information is required from at least 400 licensed fishers. It is recognized that this information could be obtained exclusively from logbooks, and if adequate sample size was achieved then this would be the preferred source. In the meanwhile it is recommended that both sources be continued and results be co-validated before either source is dropped.

Purse Seine Fisher Abundance Index (from phone questionnaires)

This survey was initiated in 1996 and provides an evaluation of biological and fishery related information from herring purse seine fishers. Attempts are made to contact all active purse seine fishers immediately after the purse seine fishery. A cumulative index is calculated in the same way as from gill net logbooks and the gill net telephone survey. This survey also provides

information on the distribution of the fishery, the percentage of dead discards, the reasons for discarding herring, and estimates of herring landed (vs. reported statistics).

Discussion

Similar concerns were raised as with the previous two surveys indices. In addition, it was noted that while the gill net telephone survey is based on observations in the spring and summer, the purse seine telephone survey is based upon observations during the fall. As a result they could provide very differing perceptions both between seasons and between fixed versus mobile gear types.

Research Recommendations

This telephone survey should be continued as, in addition to providing observations of abundance, it provides valuable information regarding discard rates and reasons for discarding.

Models to Assess Stock Status

Several models have been used to assess Newfoundland herring stocks since 1985 as follows:

Biomass estimates from acoustic surveys	1985 – 1993
Extended survivors analysis (XSA)	1994 and 1995
Research Gill net catchability analysis	1996
Integrated catch at age (ICA)	1998 and 2000
Performance Reports	2002, 2004, 2006, 2008
ADAPT	attempted in 2008 and 2009
SURBA	attempted in 2009

ADAPT 2009

The Adaptive Framework was used in 2009 in an attempt to assess the Newfoundland herring stocks using the Catch at ages 3 to 11+, 1970 – 2008 and Weights at ages 3 to 11+, 1970 – 2008.

The following indices were used for calibration:

1) Spring research gill net catch rates at ages, 1982 – 2008
2) Fall research gill net catch rates at age, 1980 – 1991
3) Acoustic biomass estimates, 1983 – 2000
4) Gill net logbook catch rates, 1996 - 2008
5) Gill net fisher cumulative index (from logbooks), 1996 – 2008
6) Purse seine fisher cumulative index, 1996 – 2008

A review of the model results precipitated the following conclusions:

1) For three of four stock areas, the precision of the model estimates decreased with the inclusion of bait estimates and dead discards.

2) Mean square residuals remained large, indicating that the 2009 calibrations did not provide a reliable estimate of current population levels.

3) Mean square residuals for the 1970 – 2000 calibration were large, suggesting that ADAPT could not provide a reliable estimate of population levels in 2000.

4) Analyses suggest that population estimates cannot be reliably estimated by ADAPT using the current model formulation.

Discussion

It was noted that since this is a framework, all the indices should be evaluated against each other for trends and consistencies before deciding on an appropriate model and model formulation. Poor residuals may be an artifact of using divergent indices to calibrate the model and without more detailed investigation it is difficult to determine if there is a data problem or a model specification problem. When queried on model choice it was suggested that most SPA based calibration models are often a matter of preference depending on the subtle differences preferred by the investigator since they all perform much the same function.

Research Recommendations

1) The calibration indices used in ADAPT should be explored for divergent trends before being introduced in the model specification in order to minimize unexplained residual patterns.

2) Investigate the potential effectiveness of more state of the art analytical models for assessing herring stocks.

3) Determine suitability of SPA models in general by determining probable values for M using historical consumption estimates for seals and cod and historic herring biomass estimates.

SURBA 2009

SURBA is a fishery independent (catch free) Survey-Based Analysis that uses age-based indices to generate relative estimates of stock sizes although the model can also use age aggregated biomass estimates. It is widely used by ICES to supplement existing catch-based VPA analyses, and to provide advice for stocks where catch data is thought to be unreliable. SURBA does not provide any diagnostics (numerical) to determine model fit. Best runs are those that provide positive and 'reasonable' estimates of mean Z, 'reasonable' estimates of spawning and total stock biomass, and 'reasonable' retrospective patterns.

SURBA was investigated here as a preliminary review of survey based data available for herring stocks using the same indices used above for calibrating the ADAPT procedure as well as the Weights-at-age matrix. For the purpose of Newfoundland herring assessments SURBA is a "work in progress".

Discussion

It was noted that unlike SPA based analyses, this method does not estimate catchability coefficients (q) and assumes a default value of one meaning that population estimates are absolute. Nevertheless, there are a variety of benchmarks in the lengthy output to assist in evaluating data sources.

Research Recommendations

1) SURBA should be further evaluated to determine if it provides reliable relative estimates of current abundance.

2) Pre-screening of indices and evaluation of catchability coefficients prior to model formulation is highly recommended.

Performance Reports

Performance reports have been used previously in the 2002, 2004, 2006, and 2008 assessments to summarize current status and prospects for each Newfoundland herring stock. They follow the traffic light method which categorizes indicators as:
1) Red: cause for concern
2) Yellow: uncertain
3) Green: positive
Five series of abundance indicators are evaluated: Research gill net catch rates; Gill net logbook catch rates; Gill net fisher observations (from logbooks); Gill net fisher observations (from telephone surveys) and Purse seine fisher observations (from telephone surveys). In addition, biological characteristics, including research gill net age compositions and year class sizes are evaluated.

There are concerns that performance reports do not provide estimates of current stock biomass or comparisons with historical estimates and that index weightings are subjective in the calculation of the performance index.

Discussion

It was pointed out that cohort strength has been a qualifying factor for stock health but it needs to be looked at in the historical sense. For example, what represents a strong year-class in one time period may not be strong in another time period even at the same abundance. The perception of catch rates and year-class strength can be skewed in the performance reports since rankings are relative to the period being considered. It was noted, however, that the reports give more weight to the longer time series to help mitigate this problem. Nevertheless, in the absence of analytical models it was agreed that performance reports are helpful in describing the general perception of the resource. It was further noted that fisheries management do find them relatively useful and have used them with guidance from science and adjusted TACs accordingly. The problem, of course, remains in the subjectivity of scaling the observations.

Research Recommendations

1. The goal continues to be the quantitative estimation of stock biomass. In its absence, performance reports provide a useful tool to document current stock status and prospects.

2. Attempts should be made to normalize catch rates and cohort strengths to a fixed period rather than a moving target which depends on the time period being evaluated.

3. Calculate age specific recruitment potential for age 3 and 4 fish using age specific catch rates from research gillnets.

Precautionary Approach

The precautionary approach is a decision making framework based upon limit and upper stock reference points. Reference points are normally based upon biomass estimates. If biomass estimates are not available, other metrics should be considered to define serious harm and to guide decision making in relation to stock condition. The conditions within an index that constitute serious harm to reproductive potential are what needs to be determined. The limit reference point must be consistent with the point below which serious harm is occurring to the stock.

The precautionary approach was first applied to Newfoundland east and south coast herring stocks in 1995 and linked exploitation rates to recruitment estimates at given spawning stock levels. It was used until 2001 when spawning stock biomass estimates were no longer available.

For Newfoundland herring stocks research gill net catch rates represent the longest and probably the best indicator of stock abundance since the early 1980s with performance index being likely the best overall indicator of stock status during the more recent period since 1996. However, neither series provides a contrast between periods of high and low abundance.

Discussion

It was suggested that where no S/R relationship has been established or is no longer available it might be useful to examine trends in abundance indices for the lowest estimates from which there was a recovery (sometimes referred to as B_{loss}). This can as least be useful as a guide for developing a proxy for B_{lim}.

Research Recommendations

1) Developing a proxy for the limit reference point should be investigated based upon research gill net catch rates.

Ecosystem Approach to Fisheries

The FRCC recommended “the implementation of an Ecosystem Approach to Fisheries (EAF) for decision making to improve fisheries management in Canada”. At the national level, the Department has released a Sustainable Fisheries Framework and three conservation and sustainable use policies:

1) Policy for applying the precautionary approach in fishery decision-making,
2) Policy on managing impacts of fisheries on sensitive benthic areas,
3) Policy on new forage species fisheries.

However, it is not yet certain how this will be applied at the regional level.

Research Recommendations

1) Estimate populations reliably. This will provide the necessary reference points which, in turn, will help determine the ecosystem impacts of the fishery.

Assessment to the Spring of 2009

White Bay-Notre Dame Bay

Abundance indices with series from 1996 to 2009 indicate that current abundance is above average and/or there is an increasing trend in abundance. The abundance index (research gill net catch rates) with a series from 1988 to 2009 indicates that current abundance is below average. Overall, stock status has improved from 2002 to 2009. However, the recruiting 2004 year class is below average for the period from 1982 to 2004 and there is no evidence of any large year classes since 1982. Current abundance is substantially lower than historical estimates in the 1970s and is probably lower than levels in the 1980s.

Bonavista Bay-Trinity Bay

Abundance indices with series from 1996 to 2009 provide mixed signals; increasing, decreasing, no change in trends. The abundance index (research gill net catch rates) with a series from 1988 to 2009 indicates that current abundance is below average. Overall, stock status improved from 2002 to 2007 but deteriorated in 2008 and 2009. The recruiting 2004 year class is below average for the period from 1982 to 2004 and there is no evidence of any large year classes since 1984. Current abundance is substantially lower than historical estimates in the 1970s and is probably lower than levels in the 1980s.

St. Mary's Bay-Placentia Bay

Three of four abundance indices with series from 1996 to 2009 indicate that current abundance is above average and/or there is an increasing trend in abundance. The abundance index (research gill net catch rates) with a series from 1982 to 2009 indicates that current abundance is below average. Currently, research gill net catch rates do not show the same trend as catch rates from gill net logbooks. Currently, observations of gill net fishers (from logbooks) are opposite those of gill net fishers (from phone surveys). Overall, stock status deteriorated from 2001 to 2004 and has remained stable since 2005. The recruiting 2004 year class is below average for the period from 1976 to 2004 and there is no evidence of any large year classes since the late 1960s. Current abundance is substantially lower than historical estimates in the 1970s and is probably lower than levels in the 1980s.

Fortune Bay

All abundance indices with series from 1996 to 2009 indicate that current abundance is below average and/or there is a decreasing trend in abundance. The abundance index (research gill net catch rates) with a series from 1982 to 2009 indicates that current abundance is below average. Overall, stock status deteriorated from 2001 to 2004 and has remained stable from 2006 to 2009. The fishery, which has expanded substantially since 2000, has fished the accumulated biomass from the 1990s when there was little or no fishery. The recruiting 2004 year class is below average for the period from 1976 to 2004. Current abundance is substantially lower than peak estimates in the mid to late 1980s.

Sources of Uncertainty

The major uncertainty in this assessment continues to be the inability to estimate current stock sizes and exploitation rates, and to place these estimates within an historical context. Models which depend upon catch at age are difficult to calibrate due to low catch levels in some areas

and years. Such models are further complicated due to uncertainties in the catch at age. Estimates of dead discards in the purse seine fishery (1996 – 2008) and estimates of herring caught for use as bait (1996 – 2008) were added to the catch at age matrices this year. However, population sizes still could not be accurately estimated using ADAPT.

The evaluation of trends within abundance indices is dependent, among other things, upon the uncertainties associated with each index. Due to the limited fishery and research data, sample sizes for most indices in these assessments, with the exception of the gill net fisher index from telephone surveys, are generally small resulting in higher uncertainties. This becomes particularly evident in their resulting residual patterns in ADAPT calibrations.

There continues to be concerns regarding how to quantify the observations of abundance of gill net and purse seine fishers in estimating current abundance.

Estimation of recruiting year class strength is important in evaluating the future prospects of these stocks. Recruitment data are available from the research gill net data set, and may be biased by systematic changes in growth. Strong year classes are normally seen across stock areas and quickly become dominant in most data sources. However, it is more difficult to predict the future prospects of weak and moderately strong year classes.

Standardization of performance reports requires the combination of several indices. In this assessment, as in the past, indices were weighted subjectively based upon the perceived degree to which each data source provides an index of abundance.

The inability to estimate population sizes has precluded (to date) the calculation of stock status zones and reference points. This severely limits the implementation of the precautionary approach in fisheries management decisions.

Appendix 1: Terms of Reference

Science Regional Advisory Process (RAP) on Assessment Framework for Newfoundland East and South Coast Herring

November 25 – 27, 2009
Comfort Inn Airport
106 Airport Road
St. John's, NL

Meeting Chairperson: Earl Dawe, Shellfish Section, Science Branch, DFO, NL Region

Terms of Reference

Context

The current (2009) integrated fisheries management plan (IFMP) for Newfoundland east and south cost herring has four objectives:

1. Stock Conservation

Conservation and the long-term sustainability of these stocks is one of the most important objectives for fisheries managers. It is vital that the stocks grow and provide benefits for all stakeholders in the short and long term. Fisheries managers work with all stakeholders to ensure this objective is achieved and that this herring stock allows for an economically viable and self-reliant fishery.

Harvesting levels will be set that allow for the stock to grow and the mature biomass to increase. Consideration will be given to the level of recruitment in this stock. Further, the fishery will be managed such that catches are not concentrated in ways that result in high exploitation rates on any of the stock components.

Fisheries managers will also work with industry to ensure adequate monitoring of all catches while minimizing by-catches of other species and small fish. They will also work with stakeholders to ensure migrating and spawning herring are not adversely impacted. This may include additional closed areas and times.

2. Ecosystem

Stemming from the conservation objectives above, ecosystem health is essential for fisheries managers. The sustainability of herring as a species within the food web, as both a prey species and consumer, will strengthen the long-term health of the ecosystem.

3. Stewardship

The shared stewardship management objective recognizes that industry participants and all stakeholders must become involved in fisheries management policy development and the decision-making process. It also recognizes that achievement of the conservation objective requires that governments, resource users and other stakeholders share responsibility for the implementation of fisheries management decisions and for their outcomes.

4. Compliance

The following Issues of management will be monitored for compliance, contributing to better health of the stock and responsible fishing practices:

- Tuck seining (modified bar seines) and sharing of catches
- Transporting of fish (barging), which currently is not permitted via conditions of license
- Bycatch of salmonids
- Length limits on tuck seines
- Undersize herring

If, during the current review, biological processes become apparent for which additional objectives might be required, these would be proposed to the Newfoundland and Labrador Small Pelagics Advisory Committee for approval.

The intent is to review the current state of scientific knowledge of the population dynamics of Newfoundland east and south coast herring and to provide a framework to assess these stocks for a five-year period from 2010 to 2014. The review is timed to coincide with the release of recommendations by the Fisheries Resource Conservation Council in their report titled: “Fishing into the future: the herring fishery in eastern Canada”.

During the review, the following components will be examined:

- Stock structure
- Commercial catch data
- Commercial sampling protocols
- Aging protocols
- Growth and maturation
- Indices of abundance
- Models to assess stock status

Throughout the review, research recommendations will be made to improve the framework. These will be recorded in the Proceedings document for later discussion and prioritization.

Objectives

<u>Stock Structure</u>

- Review information on the biological basis for the following management units used in the IFMP:
    - Labrador
    - White Bay – Notre Dame Bay
    - Bonavista Bay – Trinity Bay
    - Conception Bay – Southern Shore
    - St. Mary’s Bay – Placentia Bay
    - Fortune Bay
    - Pass Island to Cinq Cerf

Commercial Catch Data

- Review annual commercial catch data to insure, in so much as possible, that all removals of herring are included. It is imperative that annual catch data are accurate, as catch-at-age forms the basis of most analytical biomass estimation models. The review will include:
    - methods used by Policy and Economics Branch to calculate annual catches,
    - estimation of the herring caught and used for bait (in the lobster fishery),
    - estimation of herring that are discarded dead in the herring fishery,
    - estimation of herring caught as bycatch in other fisheries.

- Review available information on the bycatch of other species in the herring fishery.

Commercial Sampling Protocols

- Review the precision and potential biases of current commercial sampling protocols including:
    - the use of random samples to measure biological parameters,
    - the number of fish sampled per tonne of landings,
    - construction of catch-at-age including protocols for grouping and weighting of samples and catches.

Aging Protocols

- Review the precision and potential biases of current aging protocols including:
    - assignment of ages,
    - assignment of spawning type.

Growth and Maturation

- Review protocols to estimate growth and size and age at maturity.

Indices of Abundance

- Review the precision and potential biases of seven abundance indices documented in the 2008 assessment of Newfoundland east and south coast herring (Wheeler et al. 2008):
    - catch rates from research gill nets fished during the spring,
    - catch rates from research gill nets fished during the fall,
    - biomass estimates from acoustic surveys,
    - catch rates from gill net logbooks,
    - gill net fisher abundance index (from logbooks),
    - gill net fisher abundance index (from phone questionnaires),
    - purse seine fisher abundance index (from phone questionnaires).

Models to Assess Stock Status

- Review historical and current methods to assess stock status, including:
    - Extended Survivors Analysis (XSA),
    - Integrated Catch at Age (ICA),

- Performance Reports.

- Determine the methodology to estimate current stock sizes, including short, medium and long-term forecasts of yield.

Precautionary Approach

- Determine the feasibility of defining limit and upper stock reference points and a harvest strategy framework for herring stocks where stock estimation data are limited.

Ecosystem Approach to Fisheries

- Determine the feasibility of implementing an ecosystems approach to fisheries (EAF) including east and southeast Newfoundland herring stocks. The EAF, as defined by the FRCC, includes an overall risk assessment and risk management of human interactions with the marine environment. The objective of the EAF is to improve the ecological, social, economic, and institutional sustainability. Science considerations include the probability of an event(s) and the ecosystem impacts on retained and non-retained species.

Outputs

- CSAS Science Advisory Report outlining the assessment framework,
- CSAS Proceedings, including research recommendations,
- CSAS Research Document.

Participation

- DFO NL Science and Science representative(s) from other regions
- DFO NL Fisheries and Aquaculture Management representatives
- DFO NL Policy and Economics representatives
- Government of Newfoundland and Labrador representatives
- Memorial University (including Marine Institute) representatives
- Industry (harvester and processor) representatives
- Aboriginal Groups

Appendix 2: French Terms of Reference

Processus de consultation scientifique régional (PCSR) sur le cadre d'évaluation du hareng des côtes est et sud de Terre-Neuve

Du 25 au 27 novembre 2009

Comfort Inn Airport
106 Airport Road
St. John's, T.-N.L.

Président: Earl Dawe

Cadre de référence

Contexte

L'actuel plan de gestion intégrée des pêches (PGIP) (2009) pour le hareng des côtes est et sud de Terre-Neuve comporte quatre objectifs.

5. Conservation des stocks

La conservation et la viabilité à long terme des stocks actuels comptent parmi les plus importants objectifs des gestionnaires des pêches. Les stocks doivent s'accroître et apporter des avantages à court et à long terme pour tous les intervenants. Les gestionnaires des pêches collaborent avec tous les intervenants pour s'assurer que ces objectifs sont atteints et que ce stock de hareng peut supporter une pêche économiquement viable et autosuffisante.

Les niveaux de prélèvement qui seront établis assureront la croissance du stock et l'augmentation de la biomasse de poissons matures. Le niveau de recrutement dans ce stock sera également examiné. De plus, la pêche au hareng sera gérée de façon qu'aucune des composantes du stock ne soit soumise à un taux d'exploitation élevé.

Les gestionnaires des pêches travailleront aussi avec l'industrie pour assurer une surveillance adéquate de toutes les prises, tout en limitant les prises accessoires d'autres espèces et de petits poissons. Ils travailleront aussi avec les intervenants pour faire en sorte que le hareng ne subisse pas d'impact négatif lors des migrations ou du frai. Il est donc possible que l'on ait recours à des périodes ou à des zones de fermeture additionnelles.

6. Écosystème

La santé de l'écosystème est essentielle pour les gestionnaires des pêches dans le contexte des objectifs de conservation décrits ci-devant. La viabilité du hareng dans le réseau trophique, à la fois comme espèce proie et comme espèce prédatrice, renforce la santé de l'écosystème à long terme.

7. Gouvernance

L'objectif commun de gestion de la gouvernance tient compte du fait que les participants de l'industrie et tous les autres intervenants doivent participer à l'élaboration des politiques de

gestion des pêches et au processus décisionnel. Il tient aussi compte du fait que l'atteinte de l'objectif de conservation exige que les gouvernements, les utilisateurs de la ressource et les autres intervenants partagent les responsabilités quant à la mise en œuvre des décisions de gestion et à leurs résultats.

8. Conformité

Les points suivants feront l'objet d'une surveillance pour ce qui est de la conformité, ce qui contribuera à améliorer la santé du stock et l'utilisation de pratiques de pêche responsables :

- pêche à la senne-barge (senne modifiée) et partage des prises
- transport de poissons (par chalands), non autorisé actuellement en vertu des conditions associées aux permis
- prises accessoires de salmonidés
- limites de longueur des sennes-barge
- harengs inférieurs à la taille réglementaire

Tous les nouveaux processus biologiques pouvant nécessiter l'élaboration d'objectifs additionnels découverts dans le cadre du présent examen seront soumis au Comité consultatif sur les petits pélagiques de Terre-Neuve et du Labrador pour approbation.

Le but est de passer en revue l'état actuel des connaissances scientifiques concernant la dynamique des populations de hareng des côtes est et sud de Terre-Neuve et d'élaborer un cadre pour évaluer ces stocks sur une période de cinq ans, de 2010 à 2014. Cet examen coïncide avec la diffusion de recommandations de la part du Conseil pour la conservation des ressources halieutiques, dans son rapport intitulé « L'avenir de la pêche : Le hareng dans l'est du Canada ».

Les points suivants seront étudiés au cours de l'examen :

- structure des stocks
- données sur les prises commerciales
- protocoles d'échantillonnage commerciaux
- protocoles de détermination de l'âge
- croissance et maturation
- indices de l'abondance
- modèles pour évaluer l'état du stock

Des recommandations en matière de recherche seront formulées tout au long de l'examen afin d'améliorer le cadre. Ces recommandations, qui seront consignées dans le compte rendu, feront ensuite l'objet de discussions et seront classées par ordre de priorité.

Objectifs

<u>Structure du stock</u>

- Examiner l'information sur les fondements biologique associés aux unités de gestion suivantes qu'utilise le PGIP :
    - Labrador
    - baie Blanche – baie Notre-Dame
    - baie Bonavista – baie de la Trinité

- baie de la Conception – côte Sud
- baie Ste-Marie – baie Placentia
- baie Fortune
- Île Pass jusqu'à Cinq Cerf

Données sur les prises commerciales

- Examiner les données sur les prises commerciales annuelles pour s'assurer, dans la mesure du possible, que tous les prélèvements de hareng sont inclus. Il est important que les données sur les prises annuelles soient précises, car les prises selon l'âge constituent le fondement des modèles analytiques utilisés pour évaluer la biomasse. L'examen portera sur :
  - les méthodes utilisées par la Direction des politiques et des services économiques pour calculer les prises annuelles
  - les estimations de la quantité de harengs utilisée comme appât (dans la pêche au homard)
  - les estimations de la quantité de harengs morts rejetés dans le cadre de la pêche au hareng
  - les estimations du nombre de harengs capturés de façon incidente dans d'autres pêches.

- Examiner l'information disponible sur les prises accessoires d'autres espèces dans la pêche au hareng.

Protocoles d'échantillonnage commerciaux

- Examiner la précision et les biais potentiels des protocoles d'échantillonnage commerciaux actuels, y compris :
  - l'utilisation d'échantillons aléatoires pour mesurer les paramètres biologiques
  - le nombre de poissons échantillonnés par tonne débarquée
  - la détermination des prises selon l'âge, y compris les protocoles pour le regroupement et la pondération des échantillons et des prises.

Protocoles pour la détermination de l'âge

- Examiner la précision et les biais potentiels des protocoles de détermination de l'âge utilisés actuellement, y compris :
  - l'établissement des âges
  - l'établissement du type de frai

Croissance et maturation

- Examiner les protocoles d'estimation de la croissance ainsi que de la taille et de l'âge à la maturité.

Indices de l'abondance

- Examiner la précision et les biais potentiels des sept indices de l'abondance dont il est question dans le document « Évaluation du hareng des côtes est et sud de Terre-Neuve pour la saison 2008 » (Wheeler *et al*., 2008) :

- les taux de capture au filet maillant – selon les données de recherche du printemps
- les taux de capture au filet maillant – selon les données de recherche de l'automne
- les estimations de la biomasse dérivées des relevés acoustiques
- les taux de capture au filet maillant selon les journaux de bord
- l'indice de l'abondance des pêcheurs au filet maillant (selon les journaux de bord)
- l'indice de l'abondance des pêcheurs au filet maillant (selon les sondages téléphoniques)
- l'indice de l'abondance des pêcheurs à la seine coulissante (selon les sondages téléphoniques)

<u>Modèles pour évaluer l'état du stock</u>

- Examiner les méthodes passées et actuelles servant à évaluer l'état du stock, y compris :
  - la méthode étendue des survivants (Extended Survivors Analysis, ou XSA);
  - les prises à l'âge intégrées (Integrated Catch at Age, ou ICA);
  - les rapports de rendement.

- Déterminer une méthodologie pour estimer les effectifs actuels, y compris établir des prévisions de rendement à court, à moyen et à long terme.

Approche de précaution

- Déterminer la faisabilité d'établir, pour les stocks de hareng, des niveaux de référence limite et supérieur et un cadre stratégique d'exploitation lorsque les données relatives aux estimations du stock sont limitées.

Approche écosystémique appliquée aux pêches

- Déterminer s'il est possible d'appliquer l'approche écosystémique aux pêches, incluant celles visant sur les stocks de hareng des côtes est et sud de Terre-Neuve. Cette approche, telle que définie par le Conseil pour la conservation des ressources halieutiques (CCRH), prévoit une évaluation globale du risque et la gestion du risque associé à l'interaction entre l'homme et l'environnement marin. L'objectif est d'améliorer la viabilité de l'espèce sur les plans écologique, social, économique et institutionnel. Parmi les considérations scientifiques importantes, mentionnons la probabilité d'événements et d'impacts sur les espèces exploitées ou non exploitées.

Documents attendus

- Avis scientifique du SCCS exposant le cadre d'évaluation
- Compte rendu du SCCS incluant des recommandations en matière de recherche
- Document de recherche du SCCS

Participants

- Représentants des Sciences de T.-N.L. et d'autres régions du MPO
- Représentants de la Direction de la gestion des pêches et de l'aquaculture du MPO de T.-N.L.
- Représentants de la Direction des politiques et des services économiques du MPO de T.-N.L.
- Représentants du gouvernement de Terre-Neuve et du Labrador
- Représentants de l'Université Mémorial (y compris de l'Institut maritime)
- Représentants de l'industrie (pêcheurs et transformateurs)
- Groupes autochtones

Appendix 3: Agenda

Science Regional Advisory Process (RAP) on Assessment Framework for Newfoundland East and South Coast Herring

November 25 – 27, 2009
Comfort Inn Airport
106 Airport Road
St. John's, NL
Chair: Earl Dawe

Agenda

Wednesday, November 25th

0900 – 0930	Introductions and Overview
0930 – 1030	Stock Structure
1030 – 1045	Health Break
1045 – 1200	Commercial Catch Data
1200 – 1300	Lunch Break
1300 – 1400	Commercial Sampling Protocols
1400 – 1500	Aging Protocols
1500 – 1515	Health Break
1515 – 1615	Growth and Maturation
1615 – 1700	Review / Discussion

Thursday, November 26th

0900 – 1030	Indices of Abundance
1030 – 1045	Health Break
1045 – 1200	Indices of Abundance continued
1200 – 1300	Lunch Break
1300 – 1500	Models to Assess Stock Status
1500 – 1515	Health Break
1515 – 1615	Precautionary Approach

1615 – 1700	Ecosystem Approach to Fisheries

Friday, November 27th

0900 – 1030	Review of 2009 Assessment
1030 – 1045	Health Break
1045 – 1200	Review of 2009 Assessment continued
1200 – 1300	Lunch Break
1300 – 1500	Review Stock Advisory Report
1500 – 1515	Health Break
1530 – 1630	Review of Stock Advisory Report
1630 – 1700	Wrap Up and Adjournment

Appendix 4: List of Attendees

Name	Affiliation	Email	Phone/Fax
Earl Dawe	DFO	Earl.dawe@dfo-mpo.gc.ca	772-2076
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Craig Purchase	MUN	craig.purchase@mun.ca	
Roanne Collins	DFO-Science	Roanne.Collins@dfo-mpo.gc.ca	

Appendix 5: List of Working Papers

Wheeler, J.P., Squires, B., Williams P. An assessment framework and review of Newfoundland east and south coast herring stocks to the spring of 2009. WP2009/001.