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**Proceedings of the Newfoundland and
Labrador Regional Advisory Process
for East and Southeast Newfoundland
Atlantic Herring**

**November 1-2, 2006
80 East White Hills Road, Northwest
Atlantic Fisheries Centre
St. John's, NL**

**Meeting Chairperson
Fran Mowbray**

**Editors
G.H. Winters, N. Wells**

**Compte rendu du Processus
consultatif régional de Terre-Neuve et
Labrador sur le hareng de l'est et du
sud-est de Terre-Neuve**

**1-2 novembre 2006
80, East White Hills Road
Centre des pêches de l'Atlantique
Nord-Ouest
St. John's, T.N.-L.**

**Président de la réunion
Fran Mowbray**

**Rédacteurs
G.H. Winters, N. Wells**

Fisheries and Oceans Canada / Pêches et Océans Canada
Science Branch / Directions des sciences
PO Box 5667 / C.P. 5667
80 East White Hills Road
St. John's, NL / St. John's, TNL
Canada A1C 5X1

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200, rue Kent Street
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K1A 0E6

<http://www.dfo-mpo.gc.ca/csas/>

CSAS@DFO-MPO.GC.CA



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SUMMARY

In November 2006, DFO Newfoundland and Labrador Region conducted assessments of the White Bay - Notre Dame Bay, Bonavista Bay - Trinity Bay, St. Mary's Bay - Placentia Bay and Fortune Bay Atlantic herring (*Clupea harengus*) stocks. Summaries of the omnibus working paper and ensuing discussions are provided, as well as research recommendations intended to reduce current uncertainties and to increase the analytical power of the next assessments in 2008.

Also included are the Remit, the meeting agenda and a list of participants. Additional information on the resources assessed is available in the Science Advisory Report (SAR) (DFO 2006) and Research Document Series (Wheeler *et al.*, in prep).

SOMMAIRE

En novembre 2006, le MPO, Région de Terre-Neuve et du Labrador, a effectué des évaluations des stocks de hareng (*Clupea harengus*) de la baie Blanche, de la baie Notre-Dame, de baie de Bonavista, de la baie de la Trinité, de la baie St. Mary's, de la baie de Plaisance et de la baie de Fortune. Des sommaires du document de travail d'ensemble et des discussions qu'il a suscitées sont fournis ainsi que des recommandations sur des recherches qui pourraient contribuer à réduire les incertitudes actuelles et augmenter le pouvoir analytique des prochaines évaluations qui auront lieu en 2008.

En outre sont inclus le cadre de référence, l'ordre du jour de la réunion et une liste des participants. De l'information supplémentaire sur les ressources évaluées est disponible dans l'Avis scientifique (AS) (MPO, 2006) et le document de recherche (Wheeler *et al.*, en préparation).

INTRODUCTION

A meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on East and Southeast Newfoundland Atlantic Herring was held 1-2 November 2006 in the EPS Boardroom, Northwest Atlantic Fisheries Centre, St. John's, Newfoundland. Full assessments of the White Bay - Notre Dame Bay, Bonavista Bay - Trinity Bay, St. Mary's Bay - Placentia Bay and Fortune Bay Atlantic herring (*Clupea harengus*) stocks were conducted. Participants at the meeting included fisheries scientists and fisheries managers from DFO Newfoundland and Labrador Region, as well as representatives from the Provincial Department of Fisheries and Aquaculture and Memorial University. The meeting was not attended by representatives from DFO National Capital Region or the fishing industry.

Newfoundland herring stocks are assessed bi-annually to provide input for the 2 year herring management plan for the 2007 and 2008 fisheries. The last assessment occurred during November 2004.

Summaries of the comprehensive working paper containing assessments of all 4 stocks and ensuing discussions are provided. In addition, a detailed list of research recommendations, remedial to identified analytical shortfalls and to mitigate future assessment uncertainties, is provided.

Also included are the Remit (Appendix I), the meeting agenda (Appendix II), and a list of participants (Appendix III). Additional information on the resources assessed is available in the Science Advisory Report (SAR) (DFO 2006) and Research Document Series (Wheeler *et al.*, in prep).

Summary points for this assessment are as follows:

- As in the 2004 assessment, performance reports, including evaluation of abundance indices and biological characteristics, were used to assess the current status and prospects of each stock.
- In this assessment, greater emphasis has been given to autumn spawning herring, given their increased numbers in commercial and research gill net catches. Otherwise, the assessment methodology is the same as 2004.
- Retrospective performance reports were also prepared back to 1998 assessment. All performance reports were standardized to allow for inter-annual comparisons.
- The precautionary approach was implemented as previously by quantifying levels of concern in relation to mean research gill net catch rates.
- Based on performance reports, abundance has increased in the two northern areas, White Bay - Notre Dame Bay and Bonavista Bay - Trinity

Bay, since 2004 but is still low. Abundance has remained stable in St. Mary's Bay – Placentia Bay and has decreased in Fortune Bay since 2002.

- Most year classes produced during the 1990's were generally weak, contributing to the low abundance. The 2001 year class is the most recent year class to be recruited to the fishery and therefore is the most recent year class that may be quantified. It is above average in Bonavista-Trinity Bay, average in White Bay-Notre Dame Bay and below average in the two southern stocks.
- Concomitant with the decline in growth rate of these herring stocks since the early 1980's, length at maturity had decreased by 40 mm in 2005. Age at maturity has also declined, with the average herring now maturing at age 4 compared with age 5 in the early 1980's.
- Recent assessments of these herring stocks have shown diminished analytical content, have been increasingly based on new, untested performance indices, and are likely confounded by growth-induced changes altering the selectivity of the key research index. A series of research recommendations intended to increase the analytical power and to reduce assessment uncertainties has been put forward for implementation for the 2008 assessment.

WORKING PAPER SUMMARY

WP 2006/H1. Newfoundland East and South Coast Herring; An Assessment of Stocks to the Spring of 2006. J. P. Wheeler, B. Squires and P. Williams.

Abstract: This document provides an assessment of four herring stocks to the spring of 2006. These include White Bay-Notre Dame Bay (WB-NDB), Bonavista Bay-Trinity Bay (BB-TB), St Mary's-Placentia Bay (SMB-PB) and Fortune Bay (FB); Conception Bay-Southern Shore (CB-SS) was excluded due to lack of data.

The same data sources were available for this assessment as in 2004, augmented by several new additions. These included results from an Industry-Science acoustic survey conducted in winter 2005 in parts of SMB-PB. Results were also available from a phone survey conducted in fall 2006 to estimate the number of fixed gear gill net fishers in each stock area, including perceptions of current abundance by individuals who fished gillnets in 2006. In addition, results of three industry-based reconnaissance surveys from Cape Ray to Pass Island are presented and summarized. Of additional significance is the fact that this assessment included the contribution of autumn-spawners to commercial and research gill net catch rates. Finally, an analysis was presented of current and historical trends in length and age at maturity.

The assessment methodology employed in 2006 was the same as in 2004 and involved mostly the computation of recently developed, non-parametric opinion-based indices of stock abundance standardized for inter-annual comparisons. An analytical assessment was not attempted for reasons of calibration constraints. Following a thorough and integrative analysis of fishery and abundance statistics, performance reports were prepared on the current status and future prospects for each stock.

In general, herring landings during 2004-2006 were relatively stable and were below 50% of the TAC. Stock indices continue to show that all four stocks remain depressed well below historical peaks, due to recruitment insufficiency and somatic growth declines. Prognosis for 2007 and 2008 shows limited potential for upward change, relative to 2006 indices of abundance.

DISCUSSION

Indices Review

The assessment of herring stocks along eastern and southern Newfoundland contains considerable uncertainties. These uncertainties are mainly due to the inability to quantify the absolute level of current stock sizes and exploitation rates, and to place those estimates within an historical context.

Further, the indices upon which stock forecasts are currently made are themselves of limited value, due to a variety of factors which can be variously described as follows;

- Interpretation of research gill net trends is confounded by decadal changes in growth and maturity rates, implying systematic changes in both selection at size and at age
- Commercial gill net catch rates do not take into account possible changes in mesh size, are likely confounded by growth and maturity induced changes in selectivity, and sample sizes continue to decline.
- Telephone surveys of fishers opinions of changes in herring abundance suffer from possible perceptual bias due to variable history in the fishery and to a variable reference period for stock changes. No analyses have been performed to test their internal or external coherence and, as such, their validity as performance indices remains uncertain.
- Acoustic surveys are of limited scientific value when biomass levels are low, due to the patchiness of herring distributions and the increased likelihood that significant concentrations could be missed.

A series of research recommendations have been made, intended to reduce and remove many of the uncertainties note above and to improve the certitude of the 2008 assessment (see below).

A summary of the research findings for each stock is provided below.

WHITE BAY-NOTRE DAME BAY

- Research gill net catch rates were higher in 2006 than in 2004 but below mean levels. Interpretation of decadal trends in research gill net catch-rates is confounded by possible changes in selectivity due to temporal changes in growth and maturity. It is considered that such changes could considerably bias historical perceptions of abundance changes but less so recent inter-annual changes.
- Commercial gill net catch rates were lower in 2006 than in 2004 and below mean levels. Although generally coherent with recent trends in research gill nets, their interpretation is not only confounded by growth induced changes in selectivity but also to unknown changes in mesh size. Sample sizes continue to decline.
- Gill net fishers opinion index indicated that abundance of herring was higher in 2006 than in 2005 and was average.
- Purse seine fishers opinion index indicated that abundance of herring was higher in 2005 than in 2004 and was above average. The purse seine index does not take into account searching time and as a consequence may not consistently measure inter-annual changes in abundance.
- The 2005 research gill net age composition was not dominated by any particular year-class, continued to contain significant proportions of older year-classes but was increasingly supported by autumn spawners in recent years.
- Most indices indicate that the stock has increased since 2004 but is substantially lower than the early 1990s.
- Standardized performance indices indicate that the stock has improved since 2004 but that prospects for 2007/8 are uncertain as most recruiting year-classes are considered to be average or below average and may be biased due to changes in growth and maturity.

BONAVISTA BAY- TRINITY BAY

- Research gill net catch rates expressed in numbers were higher in 2006 than in 2004 and above average historical levels. However, due to changes in size-at-age it cannot be certain that 2006 abundance is above the long-term mean.
- Commercial gill net catch rates were higher in 2006 than in 2004 and were also above the historical mean. Due to changes in growth rates and implied

selectivity changes, it cannot be certain 2006 abundance is above the long-term mean.

- Gill net fishers opinion index indicated that abundance of herring was higher in 2006 than 2005 and was average.
- Purse seine fishers opinion index was similar in trend to that of gill net fishers.
- The 2005 research gill net age composition was dominated by the 1999 year-class, was less robust in age structure than the historical average and contained record numbers of autumn spawners.
- Standardized performance indices indicate that the stock has improved since 2004 and that prospects for 2007/8 are positive due to the above average strength of the 2001 year-class.

ST. MARY'S BAY – PLACENTIA BAY

- Research gill net catch-rates expressed in numbers were stable from 2004 to 2006 but were below the historical mean. The extent to which these catch rates are below the historical mean is uncertain due to changes in size-at-age and implied selectivity changes.
- Commercial gill net catch rates were higher in 2006 than 2004 but below the historical mean. The extent to which these catch rates are below the historical mean is uncertain due to changes in size-at-age and implied selectivity changes.
- Gill net fishers opinion index indicated that abundance of herring was higher in 2006 than in 2004 but was below average.
- Purse seine fishers opinion index indicated that abundance was similar in 2006 to 2004 and above the average.
- A joint Industry/DFO Science acoustic survey was conducted in February 2005 in Placentia Bay and St Mary's Bay. The survey did not include the entire stock area but comparisons with similar strata covered in previous surveys indicated substantial stock decline since the last survey in 2000. The extent to which this could be attributable to differences in survey timing could not be ascertained.
- The 2005 research gill net age composition was not dominated by any particular year-class and was robust relative to that of the historical average and contained near record numbers of autumn spawners.

- Standardized performance indices indicate that the stock has decreased since 2004 and that prospects for 2007/8 are below average due to the below average strength of the 2001 year-class.

FORTUNE BAY

- Research gill net catch rates expressed in numbers were higher in 2006 than in 2004 but below average historical levels. The extent to which these catch rates are below the historical mean is uncertain due to changes in size-at-age and implied selectivity changes.
- Commercial gill net catch rates were lower in 2006 than 2004 and below the historical mean. The extent to which these catch rates are below the historical mean is uncertain due to changes in size-at-age and implied selectivity changes.
- Gill net fishers opinion index indicated that abundance of herring was lower in 2006 than in 2004 and was below average.
- The 2005 research gill net age composition was not dominated by any particular year-class and was robust relative to that of the historical average and contained near record numbers of autumn spawners.
- Standardized performance indices indicate that the stock has been stable since 2004 but has declined since the early 1990's and is now well below average. As a consequence, prospects for 2007/8 are below average due to the weakness of 2001 year-class and the fact that most mature year-classes are considered to be weak.

Progress on Recommendations from 2004 RAP

Recommendation 1: Concern was expressed regarding the number of commercial fixed gear logbooks for 2002-2004. Such low numbers could lead to biased results. It is recommended that phone interviews be used. This would require a large sample size to avoid bias.

- **Progress:** A phone survey was completed in 2006 and sample sizes were robust and the index was added to the suite of performance indices.

Recommendation 2: Fishers from St. May's Bay – Placentia Bay recommended an acoustic survey and offered the use of a commercial seine fishing boat, as they felt gill nets did not provide consistent answers. This would only be possible if sufficient funds were allocated within DFO to pay DFO staff to participate in these surveys. During the meeting it was made clear that there would probably be no DFO funds to charter a vessel. The vessel would have to be supplied by industry and that the same vessel would have to be made available at the same time each year throughout the

survey time series. A meaningful survey would require a minimum time series of 5-6 years using the same boat.

- **Progress:** A joint industry/ DFO Science acoustic survey of St Mary's and Placentia Bay was conducted in February 2005 and the results were considered in the assessment of these stocks

Recommendation 3: Research should be conducted to determine whether the relationship between temperature, salinity and herring recruitment (Winters and Wheeler, 1985) persists.

- **Progress:** This was not carried out, due to time constraints and lack of an updated sequential population model.

Recommendation 4: Predator/ prey information should be updated.

- **Progress:** There was no new information to report.

Recommendation 5: Numerous fishers reported problems with mixing of large commercial sized herring and small non-commercial sized herring in the purse seine sets. The current regulations allow for a maximum of 10% (by number) of non-commercial sized herring. There was a consensus that this regulation needs to be examined in detail.

- **Progress:** There was no action taken on this matter by DFO Management.

2006 RESEARCH RECOMMENDATIONS

The assessment of herring stocks along eastern and southern Newfoundland contains considerable uncertainties. These uncertainties are mainly due to the inability to estimate current stock sizes and exploitation rates, and to place those estimates within an historical context.

Empirical estimates of stock size, such as by acoustic surveys, are the preferred source of current stock sizes. However, given the perceived low level of current abundance, such surveys would have limited chances for success, due to the contagious nature of herring concentrations which would increase the likelihood that major concentrations could be missed.

Rather, meeting participants felt that more intensive data analyses of current indices might significantly reduce uncertainties for the 2008 assessment of these herring stocks.

These data analyses recommendations are as follows:

1. The research gill net catch-rates are likely confounded by systematic changes in growth and maturation rates that have occurred since their inception. It is 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.
2. The commercial log-book abundance index suffers from very low return rates. It is recommended that return rates could be increased by sending out reminders subsequent to the initial request. It is also recommended that, should this be implemented, secondary and tertiary log-book data should be analyzed separately from that of the initial collection so as to ensure internal consistency of the full data series.
3. The gill net phone survey has common respondents to those who submit commercial gill net log books. The consistency between observed (log-book) catch rates and oral statements of annual abundance changes by common respondents should be examined by statistical analyses of these two data sets.
4. The phone questionnaire surveys may be confounded by differing reference periods from which current year estimates are compared. It is recommended that future surveys include a standard reference period, including an additional question on the respondents fishing history.
5. These herring populations have undergone significant changes in growth, maturity and spawning group classifications over the past several decades. It is recommended that a research document be prepared for the 2008 assessment in which changes in these vital rates are analyzed in relation to a variety of potential causative hypotheses.
6. A variety of abundance indices are available for these stocks, some of which are data based and others which are opinion based. It is recommended that the coherence of these various indices be statistically examined so as to clarify interpretative significance and as a guide to index weighting factors.
7. Sequential population analyses (SPA) models provide a useful window through which current abundance and exploitation rates can be compared with retrospective levels. Although routine in historical application, such models have not been used in recent assessments of these stocks for a variety of reasons, including low catch levels. Meeting participants felt that it would be useful to re-examine the utility of these models, including variants that may be constrained by earlier acoustic estimates.

PRECAUTIONARY APPROACH

A precautionary approach was developed for the 2004 assessment. It was concluded at this meeting that in order for the precautionary to be suitably applied, it would require a more comprehensive and analytical analysis of stock performance than was possible at this meeting. It was agreed that the precautionary approach will be removed from these assessments until such a time as requisite analyses are performed and on which precautionary benchmarks can be statistically applied.

REFERENCES

DFO, 2006. Assessment of Newfoundland East and South Coast Herring Stocks to 2006. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/042.

Wheeler, J.P., B. Squires and P. Williams. *In prep.* An assessment of Newfoundland east and south coast herring stocks to the spring of 2006. Can. Sci. Advis. Sec. Res. Doc. *In prep.*

Winters, G.H., and Wheeler, J.P. 1985. Interaction between stock area, stock abundance, and catchability coefficient. Can. J. Fish. Aquat. Sci. 42: 989–998.

Appendix I: Remit

**Newfoundland Herring Regional Advisory Process (RAP)
DFO, Newfoundland and Labrador Region
E. B. Dunne Boardroom, Northwest Atlantic Fisheries Centre
St. John's, Newfoundland and Labrador**

November 1-2, 2006

Meeting Chairperson:

Fran Mowbray

Meeting Content:

A review of any new information available concerning the status of East and South Newfoundland Herring as follows:

- White Bay – Notre Dame Bay
- Bonavista Bay – Trinity Bay
- St. Mary's Bay – Placentia Bay
- Fortune Bay
- Southwest Coast (Cape Ray to Pass Island)

The meeting will focus on the general state of herring stocks in Newfoundland and Labrador and identify any conservation issues requiring adjustments to the management plan.

The following topics will be discussed:

- Description of the 2004 and 2005 Commercial Fisheries
- Results of the Herring Research Gill Net Program for 2004 – 2006
- Results from Herring Commercial Fixed Gear Logbooks for 2004 – 2006
- Results of the Herring Purse Seine Questionnaires for 2004 – 2006
- Examination of Biological and Ecological Data for 2004 -2006
- Results of 2005 St. Mary's Bay – Placentia Bay Acoustic Survey
- Results of 2006 Southwest Coast Reconnaissance Surveys
- Analysis of herring age and length data in relation to age at maturity

A science advisory report (SAR), proceedings report, and an associated research document will be produced as a result of this meeting.

Role of Participants

The Department is endeavouring to ensure all stock assessment meetings are open and transparent peer review process, and provide ample opportunity for knowledgeable individuals to contribute to the process. As such, attendees are

expected to participate fully in the discussion and offer objective, informative, and constructive input that will aid in the process while respecting confidentiality requirements. It is not intended that participants come to RAP meetings merely to be informed about conclusions on stock status nor to 'lobby' regarding any issue.

Appendix II: Agenda

Herring RAP - November 1 and 2, 2006

- 1) Welcome and Opening Remarks - Chair
- 2) Introduction to Newfoundland East and South Coast - John Wheeler
- 3) Description of 2004 and 2005 Commercial Fisheries
- 4) Abundance indices:
 - a) Herring Research Gill Net Program
 - b) Herring Commercial Fixed Gear Logbooks
 - c) Herring Commercial Fixed Gear Phone Survey
 - d) Herring Purse Seine Questionnaires
- 5) Surveys
 - a) St. Mary's Bay – Placentia Bay Acoustic Survey (2005)
 - b) Southwest Coast Reconnaissance Surveys (2005)
- 6) Biological and Ecological Data
- 7) Stock Status Performance Tables
 - a) White Bay – Notre Dame Bay
 - b) Bonavista Bay – Trinity Bay
 - c) St. Mary's Bay – Placentia Bay
 - d) Fortune Bay
- 8) Development of Science Advisory Report

An opportunity for questions and discussion will be held at the end of each section.

Refreshment /lunch breaks will be taken at 10:30, 12:00 and 3:00 pm

Appendix III: List of Participants

**NL Herring Regional Advisory Process Meeting
1-2 November 2006
NWAFC, St. John's, NL**

Name	Affiliation	E-mail	Phone
Cadigan, Noel	DFO Science, NL Region	cadigann@dfo-mpo.gc.ca	772-5028
Glavine, Paul	NL Government, DFA	paulglavine@gov.nl.ca	729-3735
Healey, Brian	DFO Science, NL Region	healeybp@dfo-mpo.gc.ca	772-8674
Jones, Kate	MUN	kmjones@mun.ca	737-8833
Miller, David	DFO Science, NL Region	millerdcm@dfo-mpo.gc.ca	772-0593
Mowbray, Fran	DFO Science, NL Region (chair)	mowbrayf@dfo-mpo.gc.ca	772-5542
Nakashima, Brian	DFO Science, NL Region	nakashimab@dfo-mpo.gc.ca	772-4925
O'Connell, Mike	DFO Science, NL Region	oconnellm@dfo-mpo.gc.ca	772-2866
Purchase, Craig	DFO Science, NL Region	purchasec@dfo-mpo.gc.ca	772-6212
Shelton, Peter	DFO Science, NL Region	sheltonp@dfo-mpo.gc.ca	772-2341
Squires, Brad	DFO Science, NL Region	squiresb@dfo-mpo.gc.ca	772-5305
Walsh, Ray	DFO FAM, NL Region	walshrp@dfo-mpo.gc.ca	772-4472
Wells, Nadine	DFO Science, NL Region	wellsn@dfo-mpo.gc.ca	772-8892
Wheeler, John	DFO Science, NL Region	wheelerje@dfo-mpo.gc.ca	772-2005
Winters, George	DFO, Retired (rapporteur)	gwinters@nf.sympatico.ca	753-0246