Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences

C S A S | ***S C C S***

Canadian Science Advisory Secretariat | **Secrétariat canadien de consultation scientifique**

Proceedings Series 2009/053 | **Compte rendu 2009/053**

Proceedings of the Meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Snow Crab and Iceland Scallop

February 17-21, 2009
St John's, NL

Meeting Chairperson
Dr. Geoff Veinott

Rapporteur
Dr. G. P. Ennis

Compte rendu de la réunion du Processus de consultation scientifique régional (PCSR) de Terre-Neuve et du Labrador sur le crabe des neiges et le pétoncle d'Islande

Du 17 au 21 février 2009
St John's, TNL

Président de la réunion
Geoff Veinott, Ph.D.

Rapporteur
G. P. Ennis, Ph.D.

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

February 2010 | **février 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.

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.

Proceedings of the Meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Snow Crab and Scallop

February 17-21, 2009
St John's, NL

Meeting Chairperson
Dr. Geoff Veinott

Rapporteur
Dr. G. P. Ennis

Compte rendu de la réunion du Processus de consultation scientifique régional (PCSR) de Terre-Neuve et du Labrador sur le crabe des neiges et le pétoncle d'Islande

Du 17 au 21 février 2009
St John's, TNL

Président de la réunion
Geoff Veinott, Ph.D.

Rapporteur
G. P. Ennis, Ph.D.

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

February 2010

février 2010

ISSN 1701-1272 (Printed / Imprimé)
ISSN 1701-1280 (Online / En ligne)

Published and available free from:
Une publication gratuite de :

Fisheries and Oceans Canada / Pêches et Océans Canada
Canadian Science Advisory Secretariat / Secrétariat canadien de consultation scientifique
200, rue Kent Street
Ottawa, Ontario
K1A 0E6

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

CSAS@DFO-MPO.GC.CA

Correct citation for this publication:
On doit citer cette publication comme suit :

DFO. 2010. Proceedings of the Meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Snow Crab and Scallop; February 17-21, 2009. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2009/053.

TABLE OF CONTENTS / TABLE DES MATIÈRES

SUMMARY

A meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Snow Crab and Iceland Scallop was held February 17-21, 2009 in St. John's, Newfoundland. Its purpose was to assess snow crab stocks in Divisions 2J3KLNO, Subdivision 3Ps, and Division 4R and Iceland scallop stocks in Divisions 3N and 4R.

A Science Advisory Report (SAR) was written and reviewed in meetings from February 23 to 27, 2009. It includes overall and division-by-division summary bullets written and reviewed at the RAP meeting. Detailed rapporteur's notes of discussion on each working paper presented at the RAP, in question-and-answer/comment-and-response form, were produced. This Proceedings Report includes an abstract and summary of discussion for each working paper presented, progress on research recommendations from the 2008 RAP and a list of research recommendations from this RAP, which includes those being carried forward from last year.

SOMMAIRE

Une réunion du Processus de consultation scientifique régional (PCSR) de Terre-Neuve et du Labrador sur le crabe des neiges et le pétoncle d'Islande a eu lieu du 17 au 21 février 2009, à St. John's, Terre-Neuve. Le but de la réunion était d'évaluer les stocks de crabe des neiges des divisions 2J3KLNO, de la sous-division 3Ps et de la division 4R ainsi que les stocks de pétoncles d'Islande des divisions 3N et 4R.

Pendant les réunions tenues entre le 23 et le 27 février 2009, on a formulé et passé en revue un avis scientifique (AS). Celui-ci comprend des points du sommaire généraux ainsi que par division qui ont été rédigés et passés en revue à la réunion du PCSR. Les notes détaillées prises par le rapporteur sur les discussions concernant chaque document de travail présenté pendant le PCSR ont été produites sous la forme de questions/réponses – commentaires/réponses. Le présent compte rendu comprend un résumé ainsi qu'un sommaire des discussions pour chaque document de travail présenté, les progrès accomplis à l'égard des recommandations en matière de recherche pendant le PCSR de 2008 ainsi qu'une nouvelle liste des recommandations en matière de recherche émanant du présent PCSR et comprenant celles reportées de l'an dernier.

INTRODUCTION

A meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Snow Crab and Iceland Scallop was held from February 17-21, 2009 in St. John's, NL to assess snow crab stocks in Divisions 2J3KLNO, Subdivision 3Ps, Division 4R and Iceland scallop stocks in Divisions 4R and 3N (Lilly Carson Canyons). Terms of reference, the agenda and lists of participants and working papers presented at the meeting are provided in Appendices I through IV, respectively.

Participation included personnel of DFO Science (Newfoundland and Labrador) and Fisheries and Aquaculture Management Branches, and representatives from the fishing industry, FFAW, the Provincial Department of Fisheries and Aquaculture and Memorial University.

Open discussion and debate proceeded during and after each presentation. At the meeting, consensus was reached on overall and division-by-division summary bullets of results of the assessments. These are included in the Science Advisory Report (SAR) written and reviewed February 23-27, 2009.

These proceedings contain abstracts for working papers presented and summaries of the discussion on each. Additional information can be found in the SAR and in research documents cited or from contacts provided therein.

Working Paper Abstracts and Discussion Summaries

Presenter – D. Stansbury

Presentation title: <u>Update of the Iceland Scallop resource in the Strait of Belle Isle and the Lilly Carson Canyons</u> by D. Stansbury, F. M. Cahill and E. Hynick

Abstract – Resource status for Iceland Scallop (Chlamys islandica) was evaluated for the Strait of Belle Isle (NAFO Division 4R) and the Lilly Carson Canyons (NAFO Division 3N) based on trends in biomass and mortality. Indices were derived from fishers' logbooks and DFO surveys. There were insufficient data on pre-recruits (< 60 mm shell height), to generate an index of recruitment. The refugium in the Strait of Belle Isle that was established in 2000 to promote survival of newly settled scallop is reviewed. Removals from the Strait of Belle Isle were at a near record low, while there was no directed commercial activity in the Lilly Carson Canyons. Most recent Minimum Dredgeable Biomass estimates are 5700 t in the Strait of Belle Isle and 7500 t in Lilly Carson Canyons.

Discussion – Sharp spikes driven by the market characterize the pattern of landings in the Strait of Belle Isle scallop fishery. The Iceland scallop is not a preferred species and usually is worth fishing only when the price of scallops generally is very high. Decline from the most recent high in 1993-94 has been gradual which reflects more limited opportunities in other fisheries in the area. Landings in the recent past have been well below the 1000 t Total Allowable Catch (TAC) implemented in 2001.

A dividing line at 51° 25' N with a north/south split of the TAC was put in place to promote fishing to the north in order to avoid overfishing the southern grounds where the fishery started and has been concentrated. Effort has been low in the recent past and remains concentrated in the

south. The fishery is a day-trip only operation and it is much more economical to fish the southern grounds which are closer to home port for the majority of license holders and for all currently active fishers. This is especially so because of an agreement with buyers to limit weekly catches. There is very little decline in catch rates through the fishing season and these are higher for smaller vessels. This reflects continuous shifting of effort over the grounds which is more readily accomplished by the smaller, faster boats.

Five RV surveys which covered the entire area of Iceland scallop distribution in the Straits were conducted from 1995 to 2007. Biomass has consistently been higher in northern beds. Concerns about recruitment related to an absence of pre-recruit scallops in survey catches throughout the area lead to the establishment of a 5-mile wide corridor centered on the north/south dividing line across the Straits which was closed to fishing in 2000. The original idea of this refugium was to promote survival of pre-recruits by eliminating incidental fishing mortality, which was thought to be high in the very intensive dredge fishery. However, the 2007 survey found no sign of pre-recruits inside the refugium – the reason could be because the survey gear doesn't catch small scallops on the rough bottom in the area. In addition, there had been no change in mean size of scallops inside, density of scallops was the same inside and outside, but natural mortality was higher inside the refugium. Iceland scallops are about 7-8 years old at 60 mm which is about the smallest shuckable size and possibly the refugium hasn't been in place long enough to detect a positive effect on recruitment.

Natural mortality is the ratio of cluckers to live scallops in survey catches. Cluckers are recently dead scallops whose shells are not yet disarticulated. When scallops are shucked at sea, which is general practice in this fishery, the shells are disarticulated in the process and are not included in this mortality, although the shells are taken in the dredge. Natural mortality was also found to be higher in the northern area where there has been no fishery for many years. Higher natural mortality is associated with higher abundance of predatory starfish in un-fished areas. Lower natural mortality in the southern area where the fishery is ongoing is associated with lower starfish abundance and the shucking of scallops on the fishing grounds which provides a ready source of food for starfish.

Landings from the Lilly Carson Canyons area of NAFO Division 3N dropped sharply from a high in 1994 when the fishery started and there has only been limited and sporadic fishing there over the past 10 years. Biomass from four RV surveys conducted in the area from 1994 to 2008 has shown no clear trend over the period. However, the natural mortality rate was very high in 2008 compared to earlier years and this is associated with a substantial increase in biomass of predatory starfish which have been widely distributed in the survey area. Gaps of 4-5 years between the last three surveys preclude directly linking the timing of these changes.

Presenter – E. Colbourne

Presentation title: An assessment of the physical oceanographic environment in NAFO Divs. 2J 3KLNO and 3Ps during 2008 by E. Colbourne, J. Craig, C. Fitzpatrick, D. Senciall, P. Stead and W. Bailey

Abstract - The North Atlantic Oscillation index for 2007-08 was above normal (~0.5 standard deviation (SD) in 2008) and as a consequence, outflow of arctic air masses to the Northwest Atlantic was stronger than in 2006. This resulted in a broad-scale cooling of air temperatures throughout the Northwest Atlantic from West Greenland to Baffin Island to Labrador and Newfoundland relative to 2006. Sea-ice extent and duration on the Newfoundland and Labrador

Shelf increased in 2008 but remained below average for the 14th consecutive year. As a result of these factors, local water temperatures on the Newfoundland and Labrador Shelf generally cooled compared to 2006 but remained above normal in most areas in 2008, continuing the warmer than normal conditions experienced since the mid-to-late 1990s. Salinities in general on the NL Shelf, which were lower than normal throughout most of the 1990s, increased to the highest observed since the early 1990s during 2002 and have remained mostly above normal during the past 7 years. In particular, at Station 27 off St. John's, the depth-averaged annual water temperature decreased from the record high observed in 2006 to about normal in 2007 and to about 1 SD above normal in 2008. Annual surface temperatures at Station 27 also decreased from the 61-year record of 1.7°C (3 SD) above normal in 2006 to about normal in 2007 and to 1 SD (1°C) above normal in 2008. Bottom temperatures at Station 27 remained above normal for the 13th consecutive year. From 2004-06, they were >2.5 SD above normal but decreased to about 1 SD above normal in 2007-08. Upper-layer salinities at Station 27 were above normal for the 7th consecutive year. Annual surface temperatures on Hamilton Bank were 1.8 SD above normal, 1.3 SD above normal on the Flemish Cap and near normal on St. Pierre Bank. Bottom temperatures on Hamilton Bank were normal, ~2 SD above normal on the Flemish Cap and ~1 SD below normal on St. Pierre Bank. The area of the Cold-Intermediate-Layer (CIL) water mass on the eastern Newfoundland Shelf during 2008 was below normal for the 14th consecutive year and the 5th lowest since 1948. The average temperature and salinity during the summer of 2008 along the Bonavista section has remained significantly above normal by 2.4 and 3.3 SD, respectively. Bottom temperatures during the spring of 2008 remained slightly above normal on the Grand Banks (3LNO) but were below normal on St. Pierre Bank (3Ps). During the fall they were above normal in NAFO Div. 2J and 3K and slightly below normal in 3LNO. The area of bottom habitat on the Grand Banks covered by <0°C water during the spring decreased from near 60% in 1991 to <5% in 2004 but increased to near-normal at about 30% in 2007-08. In conclusion, water temperatures on the Newfoundland and Labrador Shelf decreased from 2006 values but remained above normal in most areas during 2007-08. A composite climate index derived from several meteorological, ice and oceanographic time series indicate a continuation of warm-salty conditions with 2008 ranking 6th warmest in 59 years of data.

References

Colbourne, E. B., Craig, J., Fitzpatrick, C., Senciall, D., Stead, P. and Bailey, W. 2009. An assessment of the physical oceanographic environment on the Newfoundland and Labrador Shelf during 2008. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/032

DFO. 2009. 2008 State of the Ocean: Physical Oceanographic Conditions in the Newfoundland and Labrador Region. DFO. Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/057

Petrie, B., R.G. Pettipas, and W.M. Petrie. 2009. An Overview of Meteorological, Sea Ice and Sea-Surface Temperature Conditions off Nova Scotia and the Gulf of Maine during 2008. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/041. vi + 32 p.

Discussion – Oceanographic conditions during 2008 were compared with long-term means and standard deviations for the 1971-2000 period throughout the presentation.

The iceberg count, which is an important index of ocean climate variability, goes back to 1900. It is done from aircraft by the US Coast Guard for the International Ice Patrol and the method has been consistent since 1984 when side-scan sonar was introduced.

Below normal salinity anomalies at Station 27 are associated with river runoff and sea ice melt in the Labrador Sea which occurs in spring/early summer and shows up in the south in late summer/early fall.

There has been a very large decline in mean bottom temperature on St. Pierre Bank in recent years. Data for St. Pierre Bank come mainly from the spring survey when it has been very cold in the recent past – spring 2008 was especially colder than normal. Much of the data for southern areas are also from fairly shallow water which promotes vertical mixing and cooling trends in the south reflect seasonal extremes. Warming anomalies tend to be seen towards the north and this is consistent with a warming climate.

Both the CIL and volume transported by the offshore branch of the Labrador Current have decreased in recent years and this seems at odds with increased ice melt in the north. However, this could be contributing to below normal temperature and increased CIL anomalies seen in spring which quickly dissipate over the summer with wind mixing.

Volume transported is driven by wind and tidal effects and by variations in horizontal density gradients generated by changing salinity. The reduced volume transported by the Labrador Current is related to increasing salinity and advection of more offshore slope water could be contributing to this. While the inshore branch of the Labrador Current probably has more influence in our fishery areas, it is fairly weak compared to the offshore branch and its variation tends to get lost in the noise of the broader picture.

Extreme seasonal variation from annual mean values is normal for ocean climate indices. It would be useful to derive seasonal values for indices being related to biological processes that are seasonal.

Presenter – E. Dawe

Presentation title: <u>An update of ocean climate effects on snow crab abundance</u> by E. Dawe and E. Colbourne

Abstract – This paper focused on updating the cross-correlation analysis between snow crab Catch Per Unit Effort (CPUE) and each of two ocean climate indices, annual sea ice extent and bottom temperature. This analysis, conducted on pre-whitened variables, provides correlation coefficients and their significance at lags ranging 0-12 years. It represents an initial part of time series analysis (ARIMA models) to identify the most appropriate lag for developing predictive models. The cross-correlation analysis and modeling had previously extended to 2004. Here we updated the cross-correlation analysis by including data from 2005-08. There remained a significant unlagged correlation between CPUE and each of ice area (postive) and bottom temperature (negative) for the longest time series (Div. 3L), suggesting that warm conditions somehow promote fishery performance. The previous analysis for each of four areas (NAFO Divisions 2J, 3K, 3L and subdivision 3Ps) had shown strongest lagged correlations of CPUE with sea ice (positive) and bottom temperature (negative) at lags of 6-10 years for most areas, suggesting that cold conditions during early life favor production or survival to recruitment. The updated analysis showed that these correlations had generally weakened. Only the correlation of Subdiv. 3Ps CPUE with bottom temperature, at a lag of 7 years, increased and gained significance. In one area (Div. 3K) the relationships lost statistical significance (CPUE vs ice area) as well as biological meaning; strongest correlations changed sign and changed from lags of 8 and 7 years to 2 years. Despite weakening or changes in some correlations, comparison

across 4 areas using two ocean climate indices still suggests that a cold regime during early life is beneficial to future abundance. Deterioration of some relationships may be in part attributable to changes in management measures and fishing practices, that respectively, promote pre-recruit survival and fishery performance.

Discussion – Cold conditions are good for future recruitment but warm conditions are good for current catchability. Zero lag is the annual environmental variable related to the crab abundance index (mean CPUE) of the same year. Both ice area and bottom temperature have real time effects on fishery performance and a lagged effect on future recruitment as reflected in the abundance index a number of years later. These are independent processes and including the zero lag provides a better fit of the model to the data. Nevertheless, the inclusion of a contemporary effect in a forecasting model is disputed. Doing so, it is suggested, would invalidate the model's use for predicting. Although it isn't clear just how from the presentation, it seems that the model is changed to exclude the unlagged effect in the forecasting part.

Station 27 is representative of bottom temperature over a broad portion of the northern Grand Bank, however, using it as a bottom temperature index for 3K and 3L could be contributing to differences in the analyses between these areas. Similarly, a single ice area index probably applies differently to each area because of differences in the extent of annual ice coverage. 2J is ice covered every year, 3K is most years and in 3L ice coverage is more variable.

The CPUE abundance index comes from raw logbook data and is a composite of all areas within each division. This kind of analysis requires a long time series over which change in spatial extent of the fishery, regulations and management practice could affect how well the catch rate index reflects abundance. There are limitations on modeling associated with the data available, nevertheless, it is assumed here that mean annual CPUE reflects changes in population abundance over the whole area.

Relationships for 3K have tended to weaken with the addition of data for the past four years to the analyses, although it makes little difference for 3L and 2J. However, there are some very strong correlations at lags that cannot be explained. This suggests that strong relationships can happen by chance, and this tends to throw doubt on the whole exercise. Nevertheless, strong relationships at certain lags seem to be based on real effects and not just coincidence. The relationship between bottom temperature and future recruitment in particular has a reasonable biological basis and offers some possibility as a forecasting tool.

Presenter – G. Legge

Presentation title: <u>Biodegradeable Twine Study: Preliminary Analysis</u> by G. Legge and C. Batten

Abstract – This report details a study of degradation rates of biodegradable twines in Newfoundland waters. The rate of degradation was based on the reduction in tensile strength for the twines selected. A total of five twines were evaluated in field trials, covering a period of 124 days. Of the five twines evaluated, three appear to be well suited for further commercial fishing trial studies. The 96-thread cotton twine, which is presently regulated for use in certain areas of the Gulf, experienced the greatest rate of degradation with the hemp and sisal twines degrading at similar rates.

Discussion – The important question in terms of ghost fishing is not the breaking strength of the twine after it has been soaking for some time, but how long it will take for the twine to disintegrate with no strain on it as the lost trap sits on the bottom – when the twine rots it will have a breaking strength of zero but how long it takes to get to that point is the question. However, how well the twine stands up to normal wear and tear is also important because a harvester doesn't have time to make repairs as they are fishing. Another consideration is how the twine stands up in storage. Crab traps are only in the water for several weeks during the fishing season and usually stored outside for the remainder of the year. Harvesters will need to know how often it will have to be replaced because there will be a lot of work involved, especially if it's used to tie in the funnel as has been suggested as another possibility.

While these are valid points, it was harvesters who originally suggested the use of biodegradeable twine as a way of dealing with ghost fishing. If it stands up for more than one fishing season, its utility for that purpose is questionable. It probably should be replaced prior to fishing each year. However, in the Gulf, where biodegradeable twine is in use, replacement every two years is the practice.

The study was modeled on one done in Alaska and what has been done so far is only a first step in a scientific approach to the question. The next step should be testing additional twines and then commercial trials to determine answers to the questions regarding wear and tear, storage , UV exposure, etc. There is no intention at this point to make any recommendations on the use of biodegradeable twine in crab traps. Harvesters seem to be interested in the issue but it's the sort of thing that will have to catch on over time.

Presenter – D. Mullowney

Presentation title: <u>Investigation into the logbook catch rate series in Division 3NO</u> by D. Mullowney, E. Dawe, E. Hynick and D. Stansbury

Abstract – The snow crab fishery performance (CPUE) index in Div. 3NO has declined since 2003. However, there is uncertainty in interpreting the index due to the introduction of mandatory vessel monitoring system (VMS) surveillance in 2004. Prior to 2004, there is high uncertainty in the reliability of spatial effort from logbooks, as it has been acknowledged that the slope edges were not intensely fished despite set locations in these areas being recorded in logbooks. Since the introduction of VMS, vessels have been forced to fish more intensely along the slope edges, thus the spatial distribution of fishing effort has changed, and the decline in CPUE could be reflective of a re-distribution of effort to marginal fishing areas. This study aims to investigate whether the decline in CPUE in Div. 3NO is real, or a function of re-distribution of effort. We isolate like areas fished (5' x 5' cells) from the pre and post-VMS periods and examine trends in CPUE from logbook and at-sea observer datasets to compare with trends in the unstandardized CPUE index. Trends in the spatially controlled logbook and observer indices agree with and validate the unstandardized logbook index, indicating a decline in fishery performance in Div. 3NO since 2003.

Discussion – The drop in CPUE in 2004 when VMS was introduced is associated with a re-distribution of effort in 3NO. Before VMS was implemented some vessels were not steaming the long distance to the offshore grounds they were supposed to be fishing. Rather, some fished much closer areas but reported catches for the 3NO area for which their license was valid based on catch rates determined from contact with vessels carrying at-sea observers fishing the area at the time. This practice could be detected with VMS.

Presenters – E. Dawe and D. Mullowney

Presentation title: An assessment of Newfoundland and Labrador Snow Crab (*Chionoecetes opilio*) in 2008 by E. Dawe, D. Mullowney, D. Stansbury, E. Hynick, P. Veitch, J. Drew, E. Colbourne, P. O'Keefe, K. Skanes, D. Fiander, R. Stead, D. Maddock-Parsons, P. Higdon, T. Paddle, B. Noseworthy, and S. Kelland

Abstract **-** Resource status was evaluated throughout NAFO (Northwest Atlantic Fisheries Organization) Divisions 2HJ3KLNOP4R based on trends in biomass, recruitment and mortality. Multiple indices of these metrics were derived from a suite of data sources that include dockside-monitored landings, fisher logbooks, observer monitoring, pre-and post-season trawl surveys, broad-scale post-season trap surveys, localized inshore trap surveys, a vessel monitoring system (VMS) and biological sampling data from multiple sources. The resource was assessed separately for offshore and inshore areas of each NAFO division, where appropriate (Div. 3KLP4R). Data availability varied among divisions and between inshore and offshore areas within divisions. Data were insufficient to evaluate resource status in Div. 3NO and in offshore Div. 4R. The fall post-season surveys in Div. 2J3KLNO indicate that the exploitable biomass was highest during 1996-98. The more limited time series from spring multi-species surveys in Div. 3LNOP also indicated a decline in exploitable biomass in the early years of the surveys. The spring and fall surveys both showed decreases in the exploitable biomass indices from 2001 to 2003-04, with little change until the fall index increased in 2007. Recruitment has recently increased overall and prospects remain promising. The survey abundance and biomass indices of pre-recruits have been increasing since 2005 due to increases in the south (Div. 3LNOPs). Longer-term recruitment prospects are uncertain but the spring and fall surveys indicate that there has been a decline in abundance indices of smallest males (<60 mm CW) in recent years that may indicate reduced biomass in the long term. Trends in indices are described in detail for each division and conclusions are presented with respect to the anticipated effects of short term changes in removal levels on fishery induced mortality.

Overview of Divisions 2HJ3KLNOP4R – E. Dawe

Discussion – Use of the spring survey in 3NOPs has been avoided in the assessment in the past because it was considered unreliable. However, more recently a strong recruitment pulse has been detected moving through to the fishery and the spring survey is now considered reliable enough to monitor such strong signals.

In the last two fall surveys more undersize, terminally molted (adult) crab have been seen. This is associated with cold conditions. At low temperature adolescents will tend to terminally molt at smaller sizes, and this can vary from year to year and area to area. The incidence of sub-legal adults is high in 3Ps where it is cold but on the slope in 3N where it's warm, adolescents get well beyond legal size.

Division 4R – D. Mullowney

Discussion – That the TAC has not been taken in recent years is not necessarily because it isn't achievable. The basic reason is economics – the cost of crab fishing and more lucrative opportunities in other fisheries. Crab is not the most important fishery in 4R as it is elsewhere and, for the most part, those remaining in the fishery in this area have limited capacity to pursue

other fisheries. 4R is a special situation where crab abundance and catch rates are very low compared to other areas. Economic considerations and opportunities in other fisheries greatly influence how much effort is directed at crab. In recent years the lobster fishery has been especially good and for most it simply hasn't been worthwhile to fish crab.

Interpretation of CPUEs for the offshore area is compromised because the fleet moves around to new fishing locations continuously through the season and there are too few fishing locations that are common to all years.

The near absence of new-shell, legal crab in the fall trap survey in the offshore area in 2008 is at odds with the increased incidence of sub-legals in 2007 – changes in pre-recruits should be reflected in recruits in the following or subsequent years. This could be related to observer subjectivity. Shell condition determination is somewhat subjective and year to year variation in results of shell condition separation from sampling done by observers may be related to different observers and their experience. The only survey data available for this area is from the fall trap survey from which there are limited data for only three years. A longer time series is required to determine trends in biomass or recruitment.

There is no biological reason for assessing inshore and offshore areas of 4R or other NAFO divisions separately. In some areas with sufficient data different trends may have been seen and the areas treated separately for that reason, but several years ago industry requested that assessments be done separately because different fleet sectors fished the inshore and offshore areas. In the more distant past there was pressure to assess on the basis of Crab Management Areas (CMAs), but with 40+ areas, for most of which data would be very limited, this was obviously unrealistic. Attempts to define stocks based on genetics showed that crab throughout Atlantic Canada are part of a large mega-population and certainly for Atlantic Canada are a single stock unit. There are undoubtedly complex patterns of larval advection throughout the area.

Division 2H – D. Mullowney

Discussion – The fishery in 2H is very small and involves only a few vessels. Even though there was a commercial TAC in place for 2008, the fishery was still partly exploratory in nature. Year to year comparison of data is suspect. Landings are affected by the TAC along with an additional quota for exploratory fishing but with new restrictions on where it can be taken. Effort increased when the TAC was put in place. The CPUE series is compromised because vessels have been moving around quite a bit and in 2008 it was largely driven by a new area in the SW corner fished for the first time. There is a great deal of variability in the 2H data that has nothing to do with the resource.

Decision making for the fishery in this area is done through negotiation because it is part of a lands claim area and managers require only basic information on status of the resource from the survey – very little weight can be placed on information from the fishery at this point in time.

Division 2J – E. Dawe

Discussion – There is no inshore/offshore split in 2J. All of the large vessels in the area have VMS but some smaller ones do not. This could explain the difference seen in the VMS and logbook CPUEs.

In the STRAP analysis, logbook catch rates are extrapolated over the survey strata. Fishing sets are not chosen randomly but rather on the basis of best fishing areas, so there could be an upward bias in STRAP CPUEs.

The CPUE time series for 2J shows a striking U shape suggesting the possibility that production varies with some regularity, possibly driven by an oscillating ocean climate variable.

The exploitable biomass index from the fall trap survey, which covers a smaller area of good commercial fishing grounds, is biased upwards because the catch rates and effective area fished by the traps are expanded to the survey strata. The index values are quite a bit higher than those from the trawl survey. Catchability of crab in the trawl is low and the survey estimate is an index only. While the trap-based estimate may be more in the ballpark of the real biomass, it is still only an index.

In the last 2-3 years, harvesters in 2J have been seeing crab in shallow water areas (~110 fm) where they haven't been seen in the past. These have not been showing up in the trawl survey. However, the survey trawl doesn't catch crab very well in shallow water because of the hard bottom. After 2000, crab in 2J seem to be distributed in fewer and fewer strata compared with earlier years. Such a pattern has been seen in other areas as well. As resource declines the distribution tends to contract into a smaller depth range, however, in more recent years as biomass increased this is not so evident and the survey has been getting good catches in deeper strata of 2J as well.

Division 3K – E. Dawe

Discussion – Although there was a very high pre-recruit biomass index from the 2006 trawl survey, the % discarded in the fishery dropped appreciably between 2005 and 2006 and has remained low. This is due to a much earlier fishery starting in 2006.

Harvesters saw a much higher proportion of large, old-shell crab at commercial sizes in 2008 and are concerned that these will be dying off before being caught and wonder if this might indicate room for an increase in TAC. However, these represent a large residual biomass left in the population after the fishery which will be cropped down each year. These crab live for 5-7 years after reaching commercial size and there is no concern about them dying off and being lost to the fishery. An increase in TAC could lead to a more rapid decline in exploitable biomass.

Increased landings and catch rates show that recruitment has increased in recent years. However, this was not detected in the recruitment indices. This, along with variably and conflicting recruitment signals among various inshore areas, creates uncertainty regarding short-term recruitment prospects.

Division 3L – D. Mullowney

Discussion – New fishing effort is showing up outside 200 miles on the Nose of the Bank. This represents vessels that are fishing crab and shrimp on the same trip which is a practice that will be increasing. This is something that will have to be factored into the VMS-based CPUE series for offshore 3L. Also, in the processing of logbook data, an upper limit of 800 has been in place for the total number of trap hauls for any given logbook entry – entries in excess of 800 have been treated as coding errors and excluded. However, particularly with buddying-up

arrangements, it is quite conceivable to have some entries in excess of 800 trap hauls in a day. This is something that will be looked at to ensure data are not being discarded needlessly.

About mid-way through the season in 2007-08, there were unusual increases in catch rate for a 2-3 week period in offshore 3L. This apparently was caused by ice conditions that delayed access to preferred fishing grounds until later in the season.

It is noted that the biomass and exploitation rate indices from the trap and trawl surveys are very different. This is because an effective area fished by a trap is applied to catch rates in the trap survey and these are then expanded to the area covered by the trawl survey to obtain a very high biomass estimate compared to the trawl. However, actual values for these indices cannot be used and only trends can be compared.

The exploitable biomass index from the trawl survey increased in 2007 and 2008 whereas the fall trap survey index remained low. The difference between the two appears to be related to spatial coverage – the trawl survey covers a very broad area whereas the trap survey is concentrated on prime crab fishing grounds. The survey biomass seems to be increasing in areas where the fishery doesn't operate, especially in the deep holes on the Bank that the fleet fishes around but not in. In 2008 the trawl survey obtained some really good catches in deep water beyond the fishing area and that might account for the divergence in trends between the two surveys. In the past when crab were more abundant they were distributed to greater depths in 3L and good catches in deep water in recent years may indicate stronger recruitment.

In offshore areas, fishers are finding that crab are getting shallower and mostly up on the Bank in depths less than 90 fm whereas in earlier years when crab were very abundant they were distributed over a much greater depth range. Spatial contraction of the crab resource to a narrower depth range when abundance is low has been seen in 3L in the past.

Some confusion was inadvertently generated during the presentation regarding depths of the survey strata. It turns out that when depth stratification was first done for the trawl survey in southern areas (Grand Bank) in the early 1970s, the charts were in fathoms, but when the survey was expanded to northern areas in 1978-79, they were in meters – that's why odd looking depths appear when fathoms are converted to meters.

Some large catches of undersize crab were taken in the 2008 trawl survey and there was a big increase in undersize crab in the fishery as well, in fact it has been many years since harvesters have seen so much undersize crab. And, in Bonavista Bay there was also a big increase in the proportion of small-clawed (adolescent) crab at legal size – it was up from 2-3% normally seen to ~30%.

With low exploitable biomass and increasing recruitment, the ratio of soft to commercial crab is expected to increase to a high level in 2009. Associated with this is an increased risk of high fishery-induced mortality on these pre-recruits. However, there is concern among harvesters about possible implications in terms of reduced quotas of raising red flags about protecting soft-shell crab. This same concern was raised last year as well but the problem did not materialize because harvesters do everything possible to avoid catching soft-shell crab. Nevertheless, the expected high incidence of soft-shell crab in 2009 needs to be stated.

It was noted that the increasing trend in CPUE for inshore 3L overall did not apply to all CMAs, however, local differences were not considered in detail. Harvesters report a very large increase in legal-sized, small-clawed crab in recent years and some of these are old shelled. These

small-clawed crab with old shells are skip molters. However, this is not reflected in size frequencies for small-mesh traps used in the inshore RV surveys. These small-mesh traps, which are deployed in all strings, retain much greater numbers of small crab compared with the large-mesh traps used by harvesters and used in the fall trap survey. Nevertheless, there is no reason why small-clawed, legal-size crab wouldn't be represented in this sampling. Small-mesh traps have been used sparingly in the fall trap survey but sampling data, including claw height measurements, have not been analyzed. However, small-mesh traps would have to be deployed at more stations before there would be enough data from common stations for year to year comparisons. Adding more sampling to the fall trap survey would pose a logistical problem – it is already a massive undertaking. It was noted though that there are quite a few stations being fished that are not common to all years and data from these are not being used in the assessment. Consideration should be given to deploying this effort differently.

Harvesters in Trinity Bay had a major problem with soft-shell crab in 2008 – there seems to be a pulse of new recruitment there. They are concerned about the absence of survey information for the area. The only sampling data are from observers and there was a high level of observer deployment there in 2008 because of the soft-shell problem. However, when observers suspect that the incidence of soft-shell crab may exceed 20%, normal sampling is discontinued and soft-shell protocols, which involve only counts to determine incidence of soft shell at legal size, are followed and this disrupts sampling coverage.

Indices of exploitable biomass and recruitment from the fall trap survey have changed little over the time series, however, signals for different inshore areas are mixed.

Division 3NO – D. Mullowney

Discussion – Landings for the northern part of CMA 8B, which is the area for which there have been reporting issues in the past, are now included in 3L, which is basically where the crab were caught, and not 3NO. In the last three years there has been an increase in percentage cells fished as CPUE declined. There have been some notable shifts in distribution of effort in recent years, particularly away from the slope in 3O, a build up on the 3N slope and a thinning of effort in the Haddock Channel and Whale Deep. In 2006 there was fishing along the 3O slope and this area accounts for most of the decline in CPUE for 3NO as a whole.

There is a great deal of noise in the CPUE series for this area. In 2008 there were changes in management measures that restricted fishing to outside the 200 mile line where the fleet tended to remain for convenience. There was also a problem with ice during the first 3 weeks of the 2008 season and the fleet couldn't access preferred areas. Although effort has been more concentrated along the shelf edge, it may be generally less successful there because much of the landings still come from areas in 3O. The drop in CPUE in Div. 3NO in recent years is not attributable to a re-distribution of effort following implemenation of VMS in 2004, rather it reflects a decline in CPUE throughout the division.

Compared to other areas, in 3NO both crab and the fishery occupy only a small part of the total area and there is variable and incomplete spatial coverage by the trap and trawl surveys as well as the observers. This leads to considerable uncertainty interpreting signals in biomass and recruitment indices for all of 3NO. The trawl survey for 3NO is mainly in 3N and misses much of the crab distribution in 3O. There are common stations in the fall trap survey only for the Whale Deep/Haddock Channel area (3O). And, most observer coverage for the past 4 years has been on the shelf edge in 3N.

Trends in CPUE indicate that exploitable biomass has declined and is at a low level.

However, the STRAP analysis of logbook data is designed to provide an estimate of average catch per square kilometer, which should be a better indicator of biomass than average catch per trap from the raw logbook data, and it showed no decrease in biomass.

Size frequencies for the 3N slope area from the trawl survey are very similar to those for the 3L slope and show a strong recruitment signal. This is consistent with the signal from the observer data for the same area. While there is uncertainty in the exploitable biomass, it appears to be low, but recruitment increase is much more certain. It appears that the ratio of incoming recruitment to exploitable biomass will be high and this increases the potential risk of high fishery-induced mortality on soft-shell crab.

Subdivision 3Ps – E Dawe

Discussion – The very high CPUEs (~ 25 kg/trap) in 1998/99, when the fishery was still expanding in the offshore area, tend to overshadow recent increases in CPUE, which is now viewed as fairly high for this area. Nevertheless, it is recognized that the recent increase was mainly in 2008 and that it was from a very low level.

The exploitable biomass index from the spring (pre-season) trawl survey remains low whereas the fall (post-season) trap survey index shows a slightly increasing trend since 2004. The best index of exploitable biomass for 2009 is the fall 2008 trap survey – it comes after the 2008 fishery whereas the 2008 spring trawl survey was done before the fishery that year. This difference in timing of the two surveys complicates direct comparison. However, even without error bars the trap survey index shows there has been a slight increase in exploitable biomass. There is greater confidence in the trap survey index because it is supported by a matching trend in the fishery CPUE. Since 2004 there has been an increase from ~ 9 to ~18 legal crab per trap in the fall trap survey and by commercial standards that is a big increase. However, landings have been increasing as well so exploitable biomass hasn't been increasing with the increasing recruitment as much as it would have had landings remained the same.

The spring survey index provides a strong signal of increasing recruitment and the trawl survey is considered reliable if the signal is strong. However, the trap survey indicates no change in recruitment from 2006-08. There is a very high proportion of sub-legal crab taken in the fall trap survey. The ratio of sub-legal to legal crab is much higher in 3Ps than elsewhere and is seen consistently in catches in the area, even in large-mesh traps. It relates to much higher proportions achieving terminal molt at smaller sizes in this area which is a population response to low temperature. In this area crab inhabit shallower water where it is colder. As a recruitment index the trap survey has a lot of caveats because of the very high incidence of sub-legals and the absence of claw height measurements – adult sub-legals could be masking the signal. The pre-recruit size group has gotten much more old shelled between 2006 and 2008 – there is either a lot of skip molters, which also occur more frequently at low temperature, or there has been an accumulation of adults that won't grow any more. Also, some of the old-shell crab in the trap survey could be intermediates that are being called old shell by the observers who only use three shell categories, and many of these could be adolescents. Although the adult sub-legals are not part of the pre-recruit index, they are indicative of year-class strength even though they don't grow to legal size.

It was noted that available claw height data for the area should be looked at and that the possibility of more small-mesh trap deployment in the fall trap survey in this area should be considered.

Confusing and mixed signals from observer data was also noted. There are uncertainties because of variation in spatial coverage of observer sampling which does not include claw height measurements either. There are two adjacent areas in offshore 3Ps where the amount discarded is very different and changes from year to year when the data are combined could relate to differences in spatial coverage. In the observer size frequencies, recruitment seems to be holding its own rather than increasing although the shift to larger sizes in the legals in 2008 suggests increased recruitment.

Observer data are also being affected as the fleet moves to 5 ½ inch mesh to avoid catching undersize crab. This may be contributing to the decline in undersize in the discards.

While the exploitable biomass may increase slightly, the pre-recruit biomass is expected to increase much more and this should be flagged to ensure that soft-shell crab are protected as much as possible. However, harvesters are concerned about continued caution against catching soft-shell crab. Fishing is earlier and the season is shorter and soft-shell crab are not being caught as in the past, so this hasn't been an issue in recent years. There has also been a big push in 3Ps to go to 5 ½ inch mesh to reduce discarding of undersize crab. This will contribute to reducing fishery-induced mortality overall.

In the STRAP analysis of inshore logbook data the lines for common and all strata come together in recent years reflecting high coverage of the general area of the survey strata by the fishery, i.e., some fishing activity in most of the strata. Their greater separation in earlier years may reflect some spatial expansion of the fishery.

Exploitable biomass has increased recently in the inshore area, but there is some uncertainty regarding an overall recruitment signal. The recruitment trend inshore is similar to offshore but at a lower level. The fall trap survey probably started when recruitment was good and getting better. While good recruitment is not over, it has probably peaked. The observer data show a sharp drop in discarding in 2008 suggesting a drop in recruitment. However, there is still uncertainty about spatial coverage by observers and how the shift to 5 ½ inch mesh is affecting observer data. The post-season trap survey index is considered more reliable – it comes after the fishery and is based on common stations. As in the offshore area, an earlier and shorter fishing season in recent years has avoided soft-shell crab in the inshore as well.

Progress on Research Recommendations from 2008 RAP

The research recommendations from the 2008 NL region snow crab RAP were:

1. Carried forward from 2007 RAP. Investigate the possibility of standardizing crab logbook data so that year-to-year comparisons of commercial CPUE as well as comparisons between fishery and survey indices can be made with greater confidence.
2. Carried forward from 2007 RAP. Continue efforts to determine how to compute Confidence Intervals (C.I.'s) for time series of mean values and estimated population indices.

3. Carried forward from 2007 RAP. Attempt to develop a recruitment index from the observer at-sea sampling data from the relationship of CPUE with mean size of legal-sized crabs.
4. Carry out a spatial analysis of 3NO effort and CPUE data with a focus on developing a better index of stock abundance.
5. Investigate the very high numbers per tow in the 2004 Campelen trawl survey in 4R, compared to latter years.
6. Investigate the shell condition classification scheme used by observers in at-sea sampling to reconcile the confusion with groupings currently used in graphs of annual catch rates and size distributions by shell category and facilitate comparison with shell condition data from research sampling.
7. Compare STRAP analyses of CPUE data for all strata and common strata.
8. Investigate bias introduced into time series of observer shell condition data by changes to sampling protocols associated with high soft-shell incidence.
9. Investigate the possibility of breaking down observer discard data by size and shell condition using observer at-sea sampling data.

Progress made for the 2008 RAP:

- Item 4: This was addressed in the WP: *Investigation into the logbook catch rate series in Division 3NO by D. Mullowney, E. Dawe, E. Hynick and D. Stansbury*

- Item 5: This was investigated and it was determined that snow crabs are consistently enumerated and sampled from this survey. It is assumed that an incomplete dataset had been accessed and a complete dataset will be sought for the next RAP.

- Item 6: This was investigated and no inconsistency was found within the observer shell condition classification scheme.

- Item 7: Use of data from all strata versus from common strata had no effect on trends in CPUE.

No progress on research recommendations 1-3 or 8-9 was presented at the 2008 RAP.

Research Recommendations from 2009 RAP

1. Carried forward from 2008 RAP. Investigate the possibility of standardizing crab logbook data so that year-to-year comparisons of commercial CPUE as well as comparisons between fishery and survey indices can be made with greater confidence.
2. Carried forward from 2008 RAP. Continue efforts to determine how to compute C.I.'s for time series of mean values and estimated population indices.
3. Carried forward from 2008 RAP. Investigate bias introduced into time series of observer shell condition data by changes to sampling protocols associated with high soft-shell incidence.

4. Carried forward from 2008 RAP. Investigate the possibility of breaking down observer discard data by size and shell condition using observer at-sea sampling data.
5. Examine the utility of post-season trap survey data from small-meshed traps, including data on claw height, in inferring recruitment prospects.
6. Investigate the effects of spatial and seasonal variation in observer coverage, and account for these effects in developing observer-based indices.

Recommended Research Documents

Update of the Iceland Scallop resource in the Strait of Belle Isle and the Lilly Carson Canyons by D. Stansbury, F. M. Cahill and E. Hynick

An assessment of Newfoundland and Labrador Snow Crab (*Chionoecetes opilio*) in 2008 by E. Dawe, D. Mullowney, D. Stansbury, E. Hynick, P. Veitch, J. Drew, E. Colbourne, P. O'Keefe, K. Skanes, D. Fiander, R. Stead, D. Maddock-Parsons, P. Higdon, T. Paddle, B. Noseworthy, and S. Kelland.

APPENDIX I: TERMS OF REFERENCE

Meeting of the Newfoundland Regional Advisory Process (RAP) on Shellfish

Salon A and B, Holiday Inn, Portugal Cove Road

St. John's, Newfoundland & Labrador
February 17-20, 2009

Northwest Atlantic Fisheries Centre, 80 East White Hills Road
St. John's, Newfoundland & Labrador
February 23-27, 2009[1]

Chair: Dr. Geoff Veinott

TERMS OF REFERENCE

Context

The status of Divisions 2J3KLNO, Subdivision 3Ps and Division 4R snow crab were last assessed in 2008. The current assessment is requested by Fisheries and Aquaculture Management to provide data that will be used in the 2009 Snow Crab Management Plan. The status of Divisions 3N and 4R for Icelandic Scallop was last assessed in 2001. The status of scallop in Divisions 3N and Lilly - Carson Canyons and 4R has a refugia area that has been closed since 1999. It is now up for review in 2009 (i.e. 10-year closure). Fishers are asking for permission to go back into this area to resume fishing activities. The current assessment is requested by Fisheries and Aquaculture Management to provide data that will be used to determine whether fishing should be permitted to resume in 2009.

Objectives

Status of the following stocks will be assessed:

- Snow Crab: Divisions 2J3KLNO; Subdivision 3Ps; and Division 4R
- Iceland Scallop: Divisions 3N Lilly - Carson Canyons and Division 4R

[1] As required, a second week has been planned to word craft the complete text of the SARs. Summary bullets for each stock will be agreed upon in plenary during the week of February 17-20, 2009. RAP Participants are encouraged to attend the second week of discussions and assist in the drafting of the SARs.

Outputs

CSAS Science Advisory Reports (SARs) and associated research documents will be produced for these assessments. A Proceedings document will record the meeting discussions.

Participants

- DFO Science, Newfoundland and Labrador and NCR
- DFO Fisheries and Aquaculture Management, Newfoundland and Labrador Region
- Industry Representatives
- Fish, Food and Allied Workers Representatives
- Provincial Department of Fisheries and Aquaculture
- Memorial University
- Aboriginal organizations
- Members of the public with knowledge of the fishery and/or snow crab biology
- Members of the public with knowledge of the fishery and/or scallop biology

+

APPENDIX II: AGENDA

Preliminary AGENDA

Meeting of the Newfoundland Regional Advisory Process (RAP) on Snow Crab and Iceland Scallop

Salon A and B, Holiday Inn, Portugal Cove Road
St. John's, Newfoundland & Labrador
February 17-20, 2009

Northwest Atlantic Fisheries Centre, 80 East White Hills Road
St. John's, Newfoundland & Labrador
February 23-27, 2009[2]

Tuesday February 17

9:00	Preliminaries	
9:30	Greetings from the Chair	Geoff Veinott
9:45	Scallops in 4R and 3N (Lilly - Carson Canyons)	Don Stansbury
10:30	Break	
10:50	Scallops cont'd with Discussion on Bullets	
12:30	Lunch	
13:30	Oceanographic Overview	Eugene Colbourne
14:45	Break	
15:00	Update on Ocean climate effects on Snow Crab abundance	Earl Dawe
17:00	Adjourn	

Wednesday February 18

9:00	Overview of the Snow Crab Resource in NAFO Divisions 2HJ3KLNOP4R	Earl Dawe
10:00	Division 2H	Darrell Mullowney
10:30	Break	
10:50	Division 2J	Earl Dawe
11:30	2HJ Bullets	
12:30	Lunch	
13:30	Update on Biodegradable Twine used in Crab Pots	George Legge (MI)
14:00	Division 3K	Earl Dawe
15:15	Break	
15:30	3K Bullets	
17:30	Adjourn	

Thursday February 19

[2] As required, a second week has been planned to word craft the complete text of the SARs. Summary bullets for each stock will be agreed upon in plenary during the week of February 17-20, 2009. RAP Participants are encouraged to attend the second week of discussions and assist in the drafting of the SARs.

9:00	Division 3L	Darrell Mullowney
10:30	Break	
10:50	3L Bullets	
12:30	Lunch	
13:30	Investigations into the catch rate series in Division 3NO	Darrell Mullowney
14:00	Divisions 3NO	Darrell Mullowney
15:00	Break	
15:30	3NO Bullets	
16:00	Division 4R and Bullets	Darrell Mullowney
17:30	Adjourn	

Friday February 20

9:00	Division 3Ps	Earl Dawe
10:30	Break	
10:50	3Ps Bullets	
12:30	Lunch	
13:30	Review of All Bullets	
15:00	Break	
15:30	Research Recommendations Other Business	
17:30	Adjourn	

Monday to Friday February 23 - 27

Writing of the Science Advisory Report (SAR) at Northwest Atlantic Fisheries Centre, 80 East White Hills Road in EPS Boardroom

NOTE: Due to weather conditions the agenda items were re-arranged from this preliminary agenda. However, all agenda items were addressed over the course of the meetings.

APPENDIX III: LIST OF PARTICIPANTS

Name	Affiliation	Address	E-mail	Tel/Fax
Best, Glen	Harvester - 3K	PO Box 332 Fogo, NL AOG 2B0	glen.best@nf.sympatico.ca	(709) 266-1414
Best, Tom	Petty Harbour Fishermen's Co-op		tbest@nl.rogers.com	(709) 747- 4835/ (709) 685-7887
Bishop, Heather	DFO Resource Management	PO Box 5667 St. John's, NL A1C 5X1	heather.bishop@dfo-mpo.gc.ca	(709) 772-2920
Bridger, Guy	Harvester – 3K	PO Box 77 Nipper's Harbour, NL A0K 3T0	guybridger@eastlink.ca	(709) 255-4551
Bussey, Nelson	Harvester – 3L	PO Box 143 Port-de-Grave, NL A0A 3J0	busseynelson@hotmail.com	(709) 786-7650/ (709) 683-2570
Butler, Derek	Association of Seafood Producers	Suite 103, Baine Johnston Centre 10 Fort WM Place St. John's, NL A1C 1K4	dbutler@seafoodproducers.org	(709) 726-3730/ (709) 726-3731
Cahill, Frank	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	frank.cahill@dfo-mpo.gc.ca	(709) 772-4877
Careen, Andy	Harvester – 3L	PO Box 14 Point Lance St. Mary 's Bay, NL A0B 1E0		(709) 338-2304
Chidley, Gerard	Harvester – 3L	PO Box 22 Renews, NL A0A 3N0	gerardchidley@hotmail.com	(709) 363-2900/ (709) 363-2014

Name	Affiliation	Address	E-mail	Tel/Fax
Coffey, Edgar. J.	Quinlan Brothers Ltd. Quin-Sea Fisherie Ltd.	215 Water Street Suite 301 St. John's, NL A1C 5J9	ejcoffey@quinlanbros.ca	(709) 739-5267/ (709) 682-9777
Coffey, Juliana	Torngat Joint Fisheries Board	Box 2050, Stn. B HV-GB, NL A0P 1E0	juliana.coffey@torngatsecretariat.ca	(709) 896-6780
Collins, Marshall	Harvester – 3K	Deep Bay Fogo, NL A0G 1W0	marshall452002@yahoo.ca	(709) 266-2753
Collins, Roanne	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	roanne.collins@dfo-mpo.gc.ca	(709) 772-5948
Crocker, Pete	Torngat Fish Co-op	PO Box 839 Happy Valley, NL A0P 1E0	petecrocker@yahoo.ca	
Davis, Chester	Harvester	PO Box 206		(709) 927-5515
Dawe, Earl	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	earle.dawe@dfo-mpo.gc.ca	(709) 772-2076
Dooley, Tom	DFA		tdooley@gov.nl.ca	(709) 729-0335/ (709)729-6082
Doyle, Tony	Harvester – 3L & 6B (<40")	PO Box 55 Bay de Verde, NL A0A 1E0	tdoyle@persona.ca	(709) 587-2375
Ennis, Jerry	Retired DFO Science		jerry.ennis@warp.nfld.net	(709) 722-7832
Evans, Geoff	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	geoff.evans@dfo-mpo.gc.ca	(709) 772-2090
Fiander, Darlene	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	darlene.fiander@dfo-mpo.gc.ca	(709) 772-6092

Name	Affiliation	Address	E-mail	Tel/Fax
Furlong, John	Seawatch	325 Newfoundland Drive St. John's, NL A1A 3R3	johnfurlong-eod@nl.rogers.com	(709) 739-1527/ (709)693-3937
Higdon, Paul	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	paul.higdon@dfo-mpo.gc.ca	(709) 772-8368
Hounsell, Gerard	FFAW	PO Box 86 Warehorn Bonavista Bay, NL A0G 4P0		(709) 678-2039
Hynick, Elaine	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	elaine.hynick@dfo-mpo.gc.ca	(709) 772-4562
Knight, Len	DFO Resource Management	1144 Topsail Road Mount Pearl, NL A1N 5E8	leonard.knight@dfo-mpo.gc.ca	(709) 772-5845
Legge, George	Marine Institute, MUN	PO Box 4920 St. John's, NL A1C 5R3	George.legge@mi.mun.ca	(709) 778-0508
Leonard, Terry	Under 35ft Crab Committee Placentia Bay	Petite Forte A0E 3A0		(709) 428-3139
Leonard, Tony	Harvester			
MacInnis, Sidney	DFO Resource Management, NHQ	200 Kent Street 13th Floor Ottawa, ON K1A 0E6	macinniss@dfo-mpo.gc.ca	(613) 991-6947/ (613) 990-7051
Mullowney, Darrell	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	darrell.mullowney@dfo-mpo.gc.ca	(709) 772-2521
O' Keefe, Paul	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	okeefep@dfo-mpo.gc.ca	(709) 772-2886

Name	Affiliation	Address	E-mail	Tel/Fax
Orr, Dave	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	david.orr@dfo-mpo.gc.ca	(709) 772-7343
Paddle, Todd	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	todd.paddle@dfo-mpo.gc.ca	(709) 772-2495
Parsons, Warren	FFAW (>40") CB	Box 11, Site 3 Bryants Cove, NL A0A 3P0	wparsons@eastlink.ca	(709) 596-3897/ (709) 589-8882
Payne, Aubrey	Harvester – 3K	PO Box 54 Seldom Fogo Island, NL		(709) 627-3235
Petten, Dwight	Offshore 3L Harvester	PO Box 45 Port-de-Grave, NL A0A 3J0	dwightpetten@hotmail.com	(709) 786-4613/ (709) 683-5234
Pilgrim, Brooks	DFO Resource Mangement	PO Box 5667 St. John's, NL A1C 5X1	brooks.pilgrim@dfo-mpo.gc.ca	(709) 772-6369
Pinksen, Larry	Harvester – 3K	Box 17 Wild Cove, NL A0K 5T0	l_pinksen@yahoo.ca	(709) 329-3321
Pitcher, Winston	Harvester – 3Ps	PO Box 365 Burin Bay Arm, NL A0E 1G0		(709) 891-4159
Ralph, John	Inshore Trinity Bay	PO Box 75 Bellevue Trinity Bay, NL A0B 1B0		(709) 442-5851/ (709) 442-5151
Rumbolt, Alton	Harvester – 2J	PO Box 21 Mary's Harbour, NL A0K 3P0	alton@nf.sympatico.ca	(709) 921-6301

Name	Affiliation	Address	E-mail	Tel/Fax
Rumbolt, Claude	Claude's Fishery Consulting	PO Box 29 Mary's Harbour, NL A0K 3P0	rcrumbolt@nf.sympatico.ca	(709) 921-6273
Russell, Dwight	Harvester – 2J	PO Box 71 Mary's Harbour, NL A0K 3P0	dwightrussell@nf.sympatico.ca/dpr398@hotmail.com	(709) 921-6398/ (709) 921-6903
Skanes, Katherine	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	katherine.skanes@dfo-mpo.gc.ca	(709) 772-8437
Slaney, Leon	DFO	PO Box 580 Grand Bank, NL A0E 1W0	leon.slaney@dfo-mpo.gc.ca	(709) 832-3014/ (709) 832-3015
Snook, Jamie	Torngat Joint Fisheries Board	Box 2050, Stn. B HV-GB, NL A0P 1E0	jamie.snook@torngatsecretariat.ca	(709) 896-6780
Stansbury, Don	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	don.stansbury@dfo-mpo.gc.ca	(709) 722-0559
Starkes, Allan	Harvester – 3K	PO Box 28 Lascie, NL A0K 3M0		
Sullivan, Keith	FFAW	PO Box 10, Stn. C 2 Steers Cove St. John's, NL A1C 5H5	ksullivan@ffaw.nfld.net	(709) 576-7276
Sutton-Pande, Vanessa	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	vanessa.sutton-pande@dfo-mpo.gc.ca	(709) 772-8892/ (709) 772-6100
Taylor, David	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	dave.taylor@dfo-mpo.gc.ca	(709) 772-7832
Tremblett, Larry	FFAW	PO Box 114 Bonavista, NL		(709) 468-2868

Name	Affiliation	Address	E-mail	Tel/Fax
Tucker, Wayne	FFAW Inshore Council	Box 3698 RR2 Corner Brook, NL A2H 6B9		(709) 783-2936/ (709) 634-8068
Veinott, Geoff	DFO Science	PO Box 5667 St. John's, NL A1C 5X1	geoff.veinott@dfo-mpo.gc.ca	(709) 772-7989
Walsh-Perry, Rosalind	Northern Coalition Labrador Shrimp Company	238 Mount Scio Road St. John's, NL A1B 4L5	rwalsh@nfld.net	(709) 722-4404
Watts, Keith	Torngat Fish Producers	PO Box 839 Happy Valley, NL A0P 1E0	gm@torngatfishcoop.com	(709) 896-3992
Way, Monty	FFAW		mway@nfld.net	(709) 634-0277
Weir, Walter	Petty Harbour Co-op	PO Box 158 Petty Harbour, NL A0A 3H0		(709) 747-2420
Winger, Paul	Marine Institute	PO Box 4920 St. John's, NL A1C 5R3	Paul.Winger@mi.mun.ca	(709) 778-0430

APPENDIX IV: LIST OF WORKING PAPERS PRESENTED

Update of the Iceland Scallop resource in the Strait of Belle Isle and the Lilly Carson Canyons by D. Stansbury, F. M. Cahill and E. Hynick

Environmental conditions on the Newfoundland and Labrador Shelf during 2008 by Colbourne E., Craig, J., Fitzpatrick, C., Senciall, D., Stead, P., and Bailey, W.

An update of ocean climate effects on snow crab abundance by Dawe, E., and Colbourne, E.

Biodegradeable Twine Study: Preliminary Analysis by Legge, G., and Batten, C.

Investigation into the logbook catch rate series in Division 3NO by Mullowney, D., Dawe, E., Hynick, E., and Stansbury, D.

An assessment of Newfoundland and Labrador Snow Crab (Chionoecetes opilio) in 2008 by E. Dawe, E., Mullowney, D., Stansbury, D., Hynick, E., Veitch, P., Drew, J., Colbourne, E., O'Keefe, P., Skanes, K., Fiander, D., Stead, R., Maddock-Parsons, D., Higdon, P., Paddle, T., Noseworthy, B., and Kelland, S.