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Proceedings of the Newfoundland and Labrador Regional Advisory Process for 2J3KL Cod, 2008

March 26-29, 2008

The Gazebo, Clovelly Golf Club, Stavanger Drive, St. John's, NL

Meeting Chairperson
Noel Cadigan

Editor
D.B. Atkinson

Compte rendu de la réunion du Processus de consultation scientifique régional de Terre-Neuve et du Labrador concernant la morue de 2J3KL en 2008

Du 26 au 29 mars 2008

The Gazebo, Club de golfe Clovelly, Stavanger Drive, St. John's, T.-N.L.

Président de réunion
Noel Cadigan

Éditeur
D.B. Atkinson

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

August 2008 | **août 2008**

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.

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CSAS@DFO-MPO.GC.CA

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SUMMARY

A Meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) was held 26-29 March 2008 in St. John's, Newfoundland and Labrador. A full assessment of the stock status of Northern (2J3KL) cod was carried out based on questions posed in the Terms of Reference (ToR) provided by the Fisheries and Aquaculture Management Branch of Fisheries and Oceans Canada (DFO). Participants included DFO staff from Science (regional as well as Ottawa), Fisheries and Aquaculture Management, and Policy and Economics branches, representatives of the fishing industry – both harvesters and members of the Fish, Food and Allied Workers (FFAW) union, the Government of Newfoundland and Labrador, the World Wildlife Fund (WWF) and scientists from Memorial University. The meeting rapporteur was D.B. Atkinson.

These Proceedings contain abstracts of PowerPoint presentations and working papers as well as summaries of the related discussions. Also included as appendices are the ToR, draft agenda, a list of participants, a list of all PowerPoint presentations and working papers available during the meeting, progress that has been made regarding previous research recommendations, the research recommendations arising from this RAP and a list of those presentations and working papers recommended for upgrade to research documents. The Proceedings do not necessarily follow the chronological order of discussions but instead are organized to match the flow of the draft agenda.

Additional information on the 2008 assessment of 2J3KL cod is available in the CSAS research document series and Science Advisory Report.

SOMMAIRE

Une réunion du Processus de consultation scientifique régional (PCSR) de Terre-Neuve et du Labrador a eu lieu du 26 au 29 mars 2008 à St. John's, Terre-Neuve et Labrador. Une évaluation complète de l'état du stock de morues du Nord (2J3KL) a été effectuée conformément aux questions posées dans le cadre de référence fourni par le secteur de la Gestion des pêches et de l'aquaculture de Pêches et Océans Canada (MPO). Du personnel du MPO provenant des secteurs des Sciences (régions et Ottawa), de la Gestion des pêches et de l'aquaculture et des Politiques et de l'économie, des représentants de l'industrie de la pêche – tant des pêcheurs que des membres du syndicat Fish, Food and Allied Workers (FFAW) –, du gouvernement de Terre-Neuve et du Labrador et du Fonds mondial pour la nature (WWF) ainsi que des scientifiques de l'Université Memorial ont participé à la réunion au cours de laquelle D.B. Atkinson était le rapporteur.

Le présent compte rendu contient des résumés des présentations Power Point et des documents de travail utilisés ainsi que des sommaires des discussions qui ont eu lieu. Il contient également, en annexe, le cadre de référence, l'ébauche du programme de la réunion, la liste des participants ainsi que la liste de toutes les présentations Power Point et des documents de travail utilisés pendant la réunion. Il fait aussi fait état des progrès accomplis quant aux recommandations antérieures en matière de recherche, expose les recommandations en matière de recherche découlant du présent PCSR et dresse la liste des présentations et des documents de travail qu'il conviendrait de transformer en documents de recherche. Le compte rendu ne respecte pas nécessairement l'ordre chronologique des discussions; il est plutôt agencé pour correspondre à l'ébauche du programme de la réunion.

De plus amples renseignements sur l'évaluation de la morue de 2J3KL en 2008 sont présentés dans la série des documents de recherche et des avis scientifiques du SCCS.

INTRODUCTION

A Meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) was held 26-29 March at the Gazebo, Clovelly Golf Course, Stavanger Drive, St. John's, NL to carry out a full assessment of the status of NAFO Divisions 2J3KL cod.

The meeting began at 0910 on March 26, 2007. Participants were welcomed by the Chairperson (Noel Cadigan of Groundfish Section, Aquatic Resources Division, Science Branch) who introduced himself then introduced Julian Goodyear, the Regional Director, Science.

The Regional Director welcomed everyone to the meeting and expressed pleasure with the diversity of participants, noting this is important given the wide range of issues to be discussed. He specifically welcomed the rapporteur, and also D. Gillis from DFO Science in Ottawa and the representative of the WWF-Canada. He also expressed his appreciation of the participation of staff from Fisheries and Aquaculture Management (FAM), and thanked Science Branch staff for their hard work in preparing for the assessment meeting.

The Chair then apologized for the meeting starting a day late but indicated the delay was necessary in order to give FAM time to better investigate conflicting data sources, that would be described later in the morning discussions.

Introductions around the table were made, followed by a reminder from the Chair that people should use the microphones while speaking as the meeting was being recorded. He described the task of the rapporteur, and then introduced Dale Richards, the RAP Coordinator.

The Chair detailed the purpose of the meeting and introduced the Terms of Reference (ToR) (Appendix I) that the work will address. He requested that everyone familiarize themselves with the 2007 SAR and noted that the outcome of the meeting will be the production of a SAR as well as a Proceedings document. He stressed that the meeting was not a place to deal with management issues unless they were for the assessment. The Chair also requested that participants respect the confidentiality surrounding the discussions and materials until the SAR is made public.

The Chair then presented a draft agenda (Appendix II). He noted that the agenda now called for a Saturday meeting due to the one day delay but noted it may not be necessary. He noted that the agenda is 'fluid' depending on availability of material as well as any other items that may arise during the discussions. He invited comments on the agenda but there were none.

Presenters were reminded to provide abstracts of their presentations and were requested to include a draft summary bullet at the end of their presentation if appropriate.

The Chair noted that any recommendations for research as well as recommendations for upgrading of working papers and presentations to research documents would be included in the Proceedings report.

The list of participants is provided in Appendix III. Not all listed participants attended all meeting sessions. The list of presentations and working papers is in Appendix IV. A description of progress in addressing previous research recommendations is in Appendix V, and the list of new research recommendations is in Appendix VI. The list of presentations and working papers recommended for upgrading to research documents is in Appendix VII.

MEETING PROCEEDINGS

OVERVIEW OF 2007 COMMERCIAL FISHERY

Presenter – Kim Penney (DFO – FAM)

Presentation Title: Northern Cod: 2007 Science and Stewardship Fishery by K. Penney

ABSTRACT:

The Resource Management representative from the Fisheries and Aquaculture Management Branch presented an overview of the 2007 commercial stewardship cod fishery. This included seasons, participation levels and catches from the 2007 cod fishery in 2J3KL. The primary differences between the 2006 and 2007 fisheries were IQ's and seasons. IQs were reduced from 3000 lb in 2006 to 2500 lb in 2007. Additionally, the season was increased from three weeks in 2006 to six weeks in 2007. The 2007 season encompassed a standard two-week fishery and four weeks in the fall, as chosen by fishers on a bay-by-bay basis. An estimated 2099 t of cod was landed in the directed cod fishery, with another 170 t taken as bycatch in other groundfish fisheries, primarily in the turbot fishery. A comparison of the 2006 and 2007 fisheries indicate participation and catch rates increased in 2007. An estimated 80% of licensed fish harvesters participated in the 2007 fishery, taking an average of 2332 lb per IQ. In relation to the overall landings in the directed cod fishery, 2% was taken in 2J, 43% in 3K and 54% in 3L.

DISCUSSION:

It was asked if the catch in 2007 increased. In response it was pointed out that there was an increase in 2007 even though the IQ went down because there was an increase in participation coupled with a longer season. The IQ's in place were 3000 lb for 2006 and 2500 lb for 2007.

The Chair noted that there is a need to describe in detail the fisheries management measures in 2005, 2006, 2007 in the SAR context section. It should be mentioned that the fishery re-opened as a stewardship fishery in 2006, involving IQ's only (no TAC); whereas the fishery in 1998-2002 was regulated by TAC.

There were no additional comments or questions.

C&P MONITORING AND COMPLIANCE IN THE RECREATIONAL AND STEWARDSHIP 2007 FISHERIES

Presenter – Ron Burton (DFO – FAM)

Presentation Title: Monitoring and Compliance: 2007 Cod Fisheries by Conservation and Protection (C&P) Branch

SUMMARY:

Abstract unavailable.

DISCUSSION:

It was asked if the numbers participating were numbers of people or number of person days. In response it was noted that it refers to fisher-days and not numbers of people. The Chair indicated that this is an important distinction – there were an estimated 70,000 fisher-days involved in the recreational fishery, not 70,000 different people in NL.

A question was posed as to whether the occurrences for investigations in 3L were in the directed or bycatch fishery? The presenter was unsure but indicated that he could find out. [This information was not provided during the meeting.]

Questions were asked regarding the cost of monitoring the recreational fishery. A fisher suggested that it would be a large amount and the presenter agreed. The presenter did not have the amount available but indicated that it could be obtained. [This information was not provided during the meeting.]

It was clarified that fisheries officers did not weigh fish sampled during the recreational fishery but instead took length measurements and used a length-weight relationship to convert to lengths to weights.

It was questioned whether the figure showing violations over time might include tag violations during the period when tags were required. It was suggested that it would be a good idea to split these out to ensure any examination of trends only included similar issues. FAM agreed.

A fisher questioned whether the weights were round or gutted since they seemed low. The weights were round and represented the overall average that included small as well as large fish.

A fisher noted that the recreational and stewardship fisheries both took place at about the same time but it appeared that there was approximately 2.5 times the amount of patrolling in the stewardship fishery. He wanted to know why this situation existed but the presenter was unable to provide an answer. Further on this, it was questioned whether 'commercial fishery' applied to all groundfish or just the stewardship fishery for cod. The presenter was unsure but indicated he would get back to people with the answer. [There was no additional information provided during the meeting.]

The FFAW representative inquired if the monitoring protocols for the recreational fishery had changed at all between 2006 and 2007. They had not.

It was clarified that the estimated recreational catch of 530 t was for all of NL whereas for 2006 the estimate was 498 t. The overall average size of fish caught also increased, being estimated at 1.36 kg in 2006 and 2.02 kg in 2007. It was observed that this seems like a substantial increase over only 1 year.

The FFAW representative expressed concerns with the estimate of about 365 t for 2J3KL in 2007, noting that in 2001, when there were less cod and more restrictions, it was estimated that about 1700 t were taken. The Chair indicated that there would be more discussion of this issue later in the meeting. He reminded participants that during the 2007 assessment, there were consistencies between the C&P estimated catch for 2006 and tagging information, although an unresolved issue was related to potential bias caused by fishers making multiple trips in a day. FAM indicated that fisheries officers were out during both good and bad days, and also have familiarity with their areas so they know if boats go out in the morning, afternoon or evening. All of this information is taken into consideration in deriving the estimates.

There were no changes in the overall design for deriving estimates compared to the C&P approach used to estimate the 2006 recreational catch in NL. The overall approach is to get a general idea of activity rather than develop detailed catch estimates. The actual observations, knowledge of the area, etc. are extrapolated to come up with the estimate of total catch.

A fisher indicated that he had difficulties with the estimate based on his observations while on the water. He wondered how much patrol work was done in the Trinity and Bonavista areas.

The presenter didn't have the information available at the meeting but it is available within DFO. [There was no additional information provided during the meeting.]

A point was made that there would be significant differences between areas depending on the activity in the area. As such, what is seen in the context of the averages may not make much sense compared to what happens in a particular area. It was agreed that in the future it would be useful to have the information broken out in more detail for the stock under question rather than having only the roll-up for all of NL available. The Chair indicated that having information bay-by-bay, vessels by week, people per vessel etc., would help in understanding the estimation steps and hence the totals derived. Having more details regarding the estimation procedure would also help in allowing better evaluation of the accuracy of the estimates.

Based on the C&P estimates, it appears that overall effort in the recreational fishery was lower in 2007 compared to 2006 (77,000 person-days in 2006 versus 70,000 person-days in 2007). A fisher indicated that he believed it was lower in the Petty Harbour area, while another suggested it had increased in the Green Bay area.

Another fisher expressed his disbelief in the estimated catch and asked if it was derived using 5 fish per person or 15 per boat. The presenter gave a general overview of how the estimate was derived using information from observations such as average number of people, average number of boats and average number of fish per person. The fisher responded that theoretically the recreational people could catch the same amount as the IQ in the stewardship fishery.

The Chair summarized that overall, the situation seems to be the same as during the 2007 assessment in that fishers do not believe the estimate of recreational catch provided. He noted that it is not possible to evaluate the estimates since the details surrounding the calculations are unknown. FAM indicated that they could provide details but there was some question as to whether this could be done before the end of the meeting. It was pointed out that having some information comparing 2006 with 2007 (participants, catch per participant, average fish size, etc.) might help in understanding things compared to looking at overall summaries.

Another fisher indicated his lack of confidence in the estimates. He suggested that some people are going out 2 or 3 times a day due to lack of monitoring. He argued that the fishery can't be monitored as there are no tags and there is no reporting when boats land. All of these lead to a lack of confidence. The presenter reiterated the procedures followed in deriving the estimates but did agree that there are some problems such as the number of small coves that can't be monitored.

A question was posed as to why the tagging program was discontinued. It was explained that since the program was a pilot in NL only, there was a large outcry about the difference compared to the rest of Atlantic Canada. Therefore the minister removed the requirement. There is still a plan to implement an Atlantic wide approach to recreational fisheries management.

The Chair summarized that overall there is broad uncertainty with the C&P estimate provided and this is not much different from the situation during the 2007 assessment. The fishers believe the estimate is too low and scientists are unclear as to the process followed in making the calculations resulting in uncertainties around the estimates. Science needs an accurate estimate of catch for stock assessment modelling and this includes the recreational catch.

2007 PHONE SURVEY OF THE NL RECREATIONAL COD FISHERY

Presenter – Fred Phalen (DFO – Policy & Economics)

Presentation Title: 2007 Survey of the Recreational Cod Fishery of Newfoundland and Labrador by F. Phalen

ABSTRACT:

In July 2007, the Minister of Fisheries and Oceans announced a five-week recreational fishery in all waters of Newfoundland and Labrador, with the fishery open from July 25 to August 19 and from September 29 to October 7. He also announced that a post-season survey of catch and effort in the fishery would be undertaken. Telephone interviews were conducted, on behalf of DFO, from October 18 to November 8 by Bristol Omnifacts, St. John's, with households stratified by Statistics Canada's Census Divisions (CD). A sample of 5055 households was selected, with appropriate sampling within each CD, to ensure statistically reliable results from the survey. The survey covered angler profile, including sex and age, fishing effort and harvest and found that:

- 65,443 adults and 7982 young anglers participated in the fishery earlier this year;
- anglers fished for almost 300,000 days (or about 4 days each) and caught 1.2 million cod (or approximately 17 per angler); and
- cod that was harvested in all waters of Newfoundland and Labrador weighed an estimated 2437 tonnes (using 2.02 kg average weight), with an estimated 2059 tonnes being taken in 2J3KL. This represents 84% of the total recreational cod harvest in NL

DISCUSSION:

A fisher questioned where the wolfish were caught. The information was not available off-hand but the presenter indicated it could be tracked down. [Nothing further was provided during the meeting.]

Another fisher commented that the wolfish numbers seemed high compared to what is taken in the stewardship fishery. He also indicated that the estimated numbers caught per fisher seemed more reasonable for his area and seem to be more accurate than the C&P estimates.

It was suggested that for 3L, an estimate of 40,000 anglers translates into about 700 being on the water each day. This seems high based on the fact that C&P officers, with 3 flights a day in 3L, didn't see this amount of activity.

The presenter explained that the survey was based on a sample of people and the results were weighted to the population of the province.

A fisher commented that if the phone survey was accurate, it would mean there was a total catch from 2J3KL of about 4000 t with 2000 t coming from the recreational fishery alone.

The Chair pointed out that similar to the situation with the C&P estimates, it would be useful to have more detail in hopes they might assist in understanding how believable the results may be. He also suggested that having people present with expertise in analysing this type of survey data would be useful. The Chair questioned if there was anything to help the meeting determine if either estimate is better.

FAM was questioned regarding their perspectives regarding the amount of recreational effort suggested from the phone survey; about 4-5 times higher than that estimated by C&P. FAM reiterated what their estimate was based on, and indicated that for the days the officers were

on the water, they didn't see as much effort as the phone survey is suggesting. An example was the phone survey estimate of 700 boats per day in 3L.

It was pointed out that there was no phone survey in 2006.

It was questioned as to whether there was anything that can be compared between the two estimates. The Chair pointed out the difficulty due to the lack of detailed data. He noted that the C&P data are available in the region but the phone survey data are in Ottawa and it would probably not be possible to get them for the meeting.

The Chair indicated that the main difference between the two estimates seems to be with regard to person-days.

The phone survey used an estimate of 2.4 kg per fish taken from an Underwater World Factsheet. It would have been better to use an actual estimate from the recreational fishery sampling.

A fisher pointed out that the phone survey results are more in line with what fishers believe is going on in the recreational fishery. FAM again pointed out that their information, from at sea work and flights, doesn't match with results of the phone survey.

It was questioned if there is any way to evaluate how much multiple trip activity there might have been. Although fishers were allowed 5 fish per day, how many might have been taking 5 then 5 then 5 on a single day? FAM indicated that there had been some covert operations and there were indeed some instances of multiple trips but there were not a lot of them.

Another fisher indicated he believed the numbers coming from the phone survey over those from C&P but he also indicated that he would like to see more detail from both regarding area fished and such so he could better evaluate the two estimates.

A FAM representative indicated that based on his work in Labrador, the 2J numbers coming from the phone survey are high. Also, based on his knowledge of the Pouch Cove area of 3L, the effort estimated from the phone survey is too high. He also made the general observation that from experience it is possible to get good information when one talks to the right people in communities.

The Chair inquired if there was any more detail available for either survey. There is a phone survey report but it probably doesn't have sufficient detail to address some of the questions raised. The presenter offered to look into this and get back to the meeting. [Nothing further was forthcoming during the meeting.]

The report on the phone survey is not available publicly yet which is problematic with regard to resolving the identified issues. STATSCAN feels that the survey was done in a reasonable way. A local consultant examined the results and did express some concerns that the estimates may be biased upwards but the extent was not known. Overall, the sense seems to be that the survey estimate may be a bit high and the C&P estimate a bit low.

The Chair noted that having a 'sense' won't help resolve the difference this week. He considered that the meeting was unable to discern which estimate is more appropriate. There is a feeling that the C&P estimate is too low but also that the phone survey estimation of person-days is too high. He indicated that the purpose of the assessment is to determine what is left in the stock after the catches are taken but at this point we can't determine what the catch was. He noted that there may be a Working Group organized within DFO to examine this situation more closely but there will not be any information available this week.

It was suggested that although there is no satisfactory way to deal with this situation, since catch is needed, perhaps analyses could be done using both estimates, or perhaps an

average. It was pointed out that catch-at-age cannot be completed until the catch issue has been resolved.

It was suggested that there may be similar problems with the 2006 data since fishers expressed the same concerns with the C&P estimate of catch during the 2007 assessment.

The FFAW representative questioned whether non-residents were included in the phone survey. They were not but it is not known if their catches might have been significant or not.

Later during day 1, discussion returned to the topic of how to handle the catch information available from the 2007 fisheries. The Chair suggested it would be a good time to decide what catch information to use and how to use it as this could be done without seeing the actual information itself. He considered that there were two options: 1) reject all of the catches and do the assessment based on trends in the various indices, and 2) do runs based on 2 scenarios – one using the phone survey estimate and the other using the C&P estimate. He noted that following the second option would lead to questions regarding what to do with the 2006 estimate of recreational fishery catch as there was no phone survey. Also, the matter of how to deal with the risk analyses would require discussion.

It was questioned if it could be established that these are the only two years with problems since there are other estimates for the recreational fisheries going back to 1995. In some years, estimates of catch came from licence returns while in others they were estimates by C&P. It was suggested that if questions are going to be raised about the estimates of catch for 2006 and 2007 when their estimation was most rigorous, then it is quite unclear how the earlier estimates should be dealt with. The Chair indicated that since the recreational catches could represent a significant portion of total removals since the moratorium was put in place, he was not sure what could be done during this meeting. He reminded people that a Working Group may look at this more closely over the next while but nothing much could be done this week.

In response to a question as to whether an analytical assessment would not be done because we don't know what the catch is, the Chair questioned if there was a catch estimate with sufficient reliability to be used in an analytical assessment (VPA or otherwise).

Further discussion then took place regarding the reliability of the C&P estimates from earlier years assuming there may be problems with the 2006 and 2007 estimates. It was also pointed out that there was only a 50% response rate in the phone survey and the question was posed as to whether this may be a problem. It was considered that just because STATSCAN has confidence that the survey was done correctly doesn't mean the results are correct. It was noted that in other fishing surveys, non-respondents had lower participation rates (in the fishery) so the assumption of this phone survey, that non-respondents had similar participation rates as respondents, may be wrong and result in an upward bias in the estimates.

The Chair summarized that the issues surrounding the 2007 estimates of the recreational catch were not going to be resolved. He suggested that debate still exists concerning the estimates for earlier years but until the 2007 situation is resolved, the estimates for earlier years can't be trusted.

It was pointed out that during the 2007 assessment, concerns were raised by fishers about the C&P estimate of recreational catch but the decision was made to use the estimate since tag return information was consistent with the C&P estimate. For the 2007 catches, the phone survey estimate of catch was 2000 t while the C&P estimate was 371 t. The approximate 4:1 ratio of tag returns (stewardship:recreational) would suggest a better fit with

the C&P estimate although using the tag return ratio would suggest a recreational fishery catch of about 500 t which is more than the C&P estimate.

The question was raised as to whether one would expect to see similarities in numbers of returns in the two fisheries given the sizes tagged and sizes caught in these fisheries. A response was that it is expected that some differences would be seen but these would not be great enough to account for the differences seen in the two estimates.

A suggestion was made to do the analytical analysis using the C&P estimate only then describe the uncertainties in catches. There was general agreement that as soon as one goes with something that is uncertain, then the door for criticism is opened. Also, the analytical model only covers a small area of the stock and there have been concerns regarding the fisheries north and south of the area covered by the analytical model in the past. There is also the issue of the catches taken offshore as bycatch in other fisheries. Did these fish come from the inshore or are they offshore fish?

It was pointed out that if the decision is to move forward without resolution to the catch estimation problem, then it is important to have text carefully worded so as to best ensure that work will be done to resolve the issue.

Discussion took place on how to report the situation in the SAR. The Chair suggested that the report should describe the situation and indicate that there are participants supporting each estimate. The FFAW representative felt that there is a need to get a handle on things and this should be reflected in the Proceedings and report.

The Chair suggested that this is not really a science issue because in the past science has not dealt with catch estimation in NL region RAP's. However, he clarified to the FFAW representative that accurate catches are important to science for use in catch-at-age models. He indicated that information on removals is not needed for commenting on what a stock has done since past trajectories can be examined and reference points determined using only survey data. The big issue is projecting forward based on future TAC options, which can't be done without catch information.

It was reiterated that the large discrepancy is mainly due to the differences in the estimated effort in the recreational fishery.

The comment was made that we could not pick an estimate without repercussions. An example provided was if the recreational catch was 2000 t in 2007 then either the assumption that catch could be inferred from tag returns was wrong, or the commercial catch would have to be several times higher.

At this point it was agreed that the only option available was to go forward with a catchless assessment (i.e. only survey and tagging) because there was no conclusion regarding the best estimate of catch. The Chair indicated that the assessment would look at the offshore survey information, Sentinel data, tagging, etc. and comment on trends over time including recruitment. He considered that most of the ToR requests could be addressed but the assessment would not be able to provide information on possible impacts of various catch levels for 2008 and beyond. The Chair did indicate that general comments regarding the future could be made based on recruitment, offshore surveys, Sentinel data, etc.

In light of the problems with determining the most appropriate level of catch, it was **recommended** that there be an investigation into the utility of catch-free assessment methods (e.g., Surba) for use in the inshore central area and offshore assessments.

OVERVIEW OF BY-CATCH IN THE TURBOT TEST FISHERY

Presenter – Len Knight (DFO – FAM)

Presentation Title: 2004-2007 3LNO Turbot PP by Len Knight

ABSTRACT:

With the advent of the Northern Cod moratorium in the early 1990's and subsequent expansion of the inshore crab fishery along the Northeast and East coast of Newfoundland, concerns were raised over the incidental catch and corresponding mortality of these species in shallow water turbot gillnet fisheries. In recognition of these concerns, measures were taken to close the inshore fishing zones and the fishing grounds at the 160 to 300 fathoms depth within the mid-shore and offshore areas of NAFO Division 3KL. These area closures were established on a long-term basis through Conservation Harvesting Provisions (CHP) of the Integrated Fisheries Management Plans (IFMP). The Inshore Fixed Gear Fleet CHP, however, contains a provision to allow for commercial testing within the closed areas to evaluate the possibilities for a re-opening of a directed gillnet Turbot fishery.

Activation of the test fishery provision in NAFO Division 3L started in 2004 and continued over the ensuing three years. Fisher participation climbed from thirteen in the first year to eighty-six in 2007. Specific management measures employed included special individualized test permits and the establishment of 3 test zones in the northern portion of 3L (north of 48 degrees 30' N latitude to 49 degrees 15' N and from approx 22 to 170 nautical miles east from land). Gear limits ranged from a high of 150 gillnets in zone 3 to a low of 60 nets in zone one depending on the zone, year and problems encountered in the fishery. Generally, the gillnet limit for each of the three zones decreased over the four year period due to undesirable incidental crab and groundfish catch results. A six inch mesh size minimum was mandatory and appeared to be the standard gillnet mesh used by all fishers.

License conditions restricted incidental Cod catch to 10% daily (of turbot catch) to a season cap of 2000 lbs round weight for 2004 and 2005. The cap increased to 3000 lbs in 2006 and 2500 lbs in 2007 reflecting limits approved for the Northern Cod Stewardship fishery. Once fishers reached their Cod seasonal cap, either through a directed fishery or by way of by-catch in other groundfish fisheries, by license condition they were obligated to cease all groundfish fisheries for the remainder of the year. A "three strikes" provision was also in play in the test fishery requiring fishers to exit the fishery should they encounter three daily occurrences of > 10% Cod by-catch. Commencing in 2005, a minimum of twenty deepwater floats were required on the head-ropes of each turbot gillnet; a measure adopted to mitigate high crab by-catch occurrences.

Seasons for the test fishery ranged from early August to late October depending on the number of fishers licensed in the year and available "< 65 foot vessel fixed gear" fleet sector TAC. Test fishing trips completed increased from 61 in 2004 to a high of 248 in 2005 and averaged 157 for the last two years. At-sea Observer coverage (observed trips) was very high in 2004 (72%) and 2005 (61%) but due to lower funding levels, dropped off to 24% and 30% respectively in the later years.

Average Cod incidental catch, relative to the landed turbot catch, was at or below 2% for the 3 years from 2004 to 2006 but ballooned to 18% in 2007. The highest Cod by-catch trip per season increased over the four year series; from 9% (461 lbs cod vs. 5122 lbs Turbot) in 2004, 20% (1162 lbs vs. 5810 lbs) in 2005, 14% (2768 vs. 19,771) in 2006, to 306% (11,801 vs. 3862) in 2007. It is evident that 2007 was a markedly different year for Cod by-catch and that high by-catch trips were apparent through-out the early August to late October Turbot test fishery.

DISCUSSION:

Clarification of the sources of information was requested. It was reported that landings came from the Dockside Monitoring Program. Discard information came from observers if they were on board; otherwise the information was from logbooks.

It was clarified that this is a test fishery only. There were problems with cod bycatch in 2006 and especially in 2007. There are no plans yet regarding what might be done in 2008. Fishers with cod IQ's were told to save their cod allocation for the turbot fishery.

A fisher commented that the fishery opened on August 1 and was only open for 4-5 days. He pointed out that vessels with observers were not allowed to go out again but those without were allowed to. He stated that boats that were allowed to go out again had higher bycatches of cod about 55 miles off Catalina in October than they had in August.

It was noted that with a bycatch in 2007 of 150 t of cod, there were clearly lots of cod in the area where the test fishery was prosecuted but it would be interesting to look at catch rates since they didn't seem exceptional compared to those inshore. The fish caught were clearly well into the commercial size range and should have shown up in the 2006 test fishery. Perhaps there has been some movement or migration taking place.

A fisher questioned if there was any tagging information from these catches. Only 1 tag has been returned. The exact location it was caught was not reported – just Funk Island Bank (which is in 3K). The fish had been tagged in Smith Sound in 2006.

BY-CATCH OF COD IN THE TURBOT FISHERY

Presenter – Brian Healey (DFO – Science)

Presentation Title: By-Catch of Cod in Turbot Fishery by B. Healey

ABSTRACT:

In 2007, several fishers reported increased by-catch of cod in the turbot fishery. Using information from fishers logbooks and length samples collected by at-sea observers, we review cod by-catch from the turbot fishery over 2002 - 2007. Investigation of the distribution of both turbot catches and cod by-catch reveals virtually all of the landed cod by-catch in turbot fisheries is from the 3L turbot gillnet test fishery. This test fishery was initiated in 2004 with additional regulations to try and prevent excessive crab by-catch. Participation in the test fishery has increased in each subsequent year. Fishing occurs in water depths of 160-300 fms (292-549 m), primarily in NAFO unit areas 3Lc. The cod by-catch in 2007 (157 t) exceeded the total by-catch over the entire 2002-2006 period (48 t). The substantial increase in cod by-catch in 2007 is far more than might be expected due to increases in effort.

DISCUSSION:

It was clarified that the 'catch frequencies' were sampled by observers at sea while the 'landing frequencies' were from port sampling. The overall frequencies were derived by adjusting for catch weight then aggregating. It was noted that there were differences in the catch and landed frequencies, with the catch frequencies, even from gillnets, showing many small fish such as in 2005. Overall though, the sampling intensity was low then.

It was noted that for the 2007 fishery the logbook data are still preliminary but the length frequencies are not.

A question was raised concerning the amount of gear used. A fisher indicated that there was a reduction in the number of nets used in 2007 because of the amount of turbot available.

With the high catch rates and low quota, it was necessary to reduce the number of nets so as to avoid quota over-runs.

The Chair questioned whether mean lengths over time should be examined. He suggested this would be useful since the average size of cod in the bycatch may be increasing and this would be consistent with the survey results. The presenter indicated that this was not available but it could be prepared.

The question was again posed as to where these fish may have come from. It was questioned if there might be anything in the oceanographic data to suggest what might be happening.

A question was asked about what the cod were feeding on. They were eating capelin, shrimp and crab.

A fisher indicated that 54 miles off Catalina, they were getting 100 lb cod per net on October 26 and they had 50 nets set.

The Chair questioned if the increase in catch rates might be due to cod growth to within the selection range of the gear being used or because of increased abundance. It was questioned as to why these two might be distinct.

A fisher indicated that if 36 inch cod were being caught in 6" gillnets, then there must be a lot out there. The minimum mesh in the test fishery was 6" with some using 6½". Fish of all sizes were being caught, both big and small and the observer data should be able to confirm this.

The Chair speculated that based on the bycatch data, it looks like year-classes coming through – those of 2003 to 2006. He questioned if anything was learned from examination of the length frequencies. The presenter indicated that there was strong bimodality in 2003. Also, it is known that the 2002 year-class is relatively strong. It was considered that this could be examined further by converting the length frequencies to age using the age-length key for gillnets. Alternatively, the research vessel length frequencies could be examined. The problem would be different selectivites between the research survey gear and gillnets.

It was agreed that the research surveys are measuring the offshore component but the question was posed as to what component is being taken in this test fishery for turbot. It was considered possible that age composition information may help resolve this. As such, the presenter agreed to provide the bycatch information by year and age. He cautioned that there may not be any ageing information prior to 2007.

OCEANOGRAPHY

Presenter – Joe Craig (DFO – Science)

Presentation Title: *Physical Oceanographic Conditions on the Newfoundland and Labrador Shelf during 2007 by E. Colbourne, J. Craig, C. Fitzpatrick, D. Senciall, P. Stead and W. Bailey*

ABSTRACT:

Oceanographic observations on the Newfoundland and Labrador Shelf during 2007 are presented in relation to their long-term (1971-2000) means. At Station 27 off St. John's, the depth-averaged annual water temperature decreased from the record high observed in 2006 to about normal. Annual surface temperatures at Station 27 also decreased from the 61-year record of 1.7°C above normal in 2006 to 0.2°C above normal in 2007. Bottom temperatures decreased from 0.8°C above normal in 2006 to 0.4°C above normal in 2007. Annual surface

temperatures on Hamilton Bank and the Flemish Cap were 0.5°C above normal and on St. Pierre Bank they were about normal. Upper-layer salinities at Station 27 were above normal for the 6th consecutive year. The area of the Cold-Intermediate-Layer (CIL) water mass on the eastern Newfoundland Shelf during 2007 was below normal for the 13th consecutive year and the 14th lowest since 1948. Bottom temperatures during the spring of 2007 remained above normal on the Grand Banks but were below normal on St. Pierre Bank. During the fall they were significantly above normal in NAFO Divisions 2J and 3K and most of 3L, but were below normal in the shallow areas of 3NO. The area of bottom habitat on the Grand Banks covered by sub-zero water decreased from >50% during the first half of the 1990s to near 15% during 2004-2006 but increased to near-normal at about 30% in 2007. In general, water temperatures on the Newfoundland and Labrador Shelf decreased from 2006 values but remained above normal in most areas. Notable exceptions were on St. Pierre Bank during spring where temperatures were below normal and in northern areas of NAFO Divisions 2J and 3K where bottom temperatures were significantly above normal during the fall of 2007.

DISCUSSION:

It was clarified that the contouring was done using kriging. As the inshore area was not surveyed in 2007, the estimated temperature differences between 2006 and 2007 in the inshore areas are spurious. However, water temperatures in offshore 2J3K were warmer in 2007, particularly in the vicinity of the shelf edge.

The Chair questioned whether there were any temperature signals that might help explain the increased catches offshore. Bottom temperatures were higher in 2006 compared to 2007 although they were above normal in both years.

There were other points clarified regarding trends in bottom temperatures and along the Bonavista Line.

BRIEF REVIEW OF 2007 ASSESSMENT

Presenter – John Brattey (DFO – Science)

Presentation Title: Northern (2J3KL) Cod: Review of the previous assessment March 2007 RAP (CSAS SAR 2007/018) by J. Brattey

ABSTRACT:

See

DFO, 2007. Stock Assessment of Northern (2J3KL) cod in 2007. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/018.

DISCUSSION:

The Chair noted that many of the items presented will be revisited and updated during this assessment meeting. There was no further discussion of the presentation.

INSHORE DATA

Sentinel Survey Overview Standardization Results

Presenter – Dawn Maddock Parsons (DFO – Science)

Presentation Title: Sentinel Surveys 1995-2007: Catch per Unit Effort in NAFO Divisions 2J3KL by Dawn Maddock Parsons and Rick Stead

ABSTRACT:

Data from the Sentinel program in NAFO Divisions 2J3KL are summarized and updated with 2007 data. Mean gillnet (5 ½") catch rates (numbers of fish per net) in Divisions 3K and 3L were relatively high in 1996 and 1997, increased to the highest value in 1998 and then decreased to 2003. Since then catch rates have trended upward from 2002-2007. In 2J, although catch rates in 5 ½" gillnet were very low in all years, they show a marked increase in 2005 and remain at similar levels through 2007. Small mesh gillnet catch rates have been more variable and trends are more difficult to discern, probably due to the ability of this gear to catch fish from two distinct size ranges. Linetrawl catch rates (number of fish per 1000 hooks) in Divisions 3K and 3L showed similar trends to 5 ½" gillnet, decreasing from the late 90s to the early 2000s and then generally increasing in recent years. In 2006 and 2007, however, catch rates in Division 3L dropped from the 2004-2005 levels, and were the lowest catch rates in this Division for this gear. There has been no linetrawl activity in Division 2J since 2001.

Spatially, catch rates have been variable from year to year and place to place. Higher catch rates have been most consistent from Happy Adventure to Little Catalina in 5 ½" gillnet and from Wesleyville to Bay de Verde in small mesh gillnet.

Presentation Title: <u>2J3KL Cod Sentinel Index</u> by Dawn Maddock Parsons

ABSTRACT:

Sentinel cod catch rates for the period 1995-2007 were modeled to provide annual indices for cod in inshore 2J3KL. Analysis was conducted for 2J3KL and for three subareas: Northern inshore (2J+3Kad), Central inshore (3Khi+3Lab) and Southern inshore (3Lfjq). Catch rates for three gears were used: 3¼" gillnet, 5½" gillnet and linetrawl. Both aggregated and age disaggregated indices were developed. The catch rate indices have shown general improvement since 2002. The 2002 year-class is relatively strong in all three indices. Results of the standardization were similar to the unstandardized Sentinel results.

DISCUSSION:

The Chair noted that the first presentation regarding unstandardized data basically described the input data for the second presentation.

A fisher commented that for 2J in 2007, catches would have been better for gillnets except there was a lot of slub in the water. Fishers using hook and line did get their quotas and in places where gillnet catches were small, fish could be taken on baited hook. The FFAW representative indicated that the slub problem was wide-spread throughout the NE coast and this could affect catch rates.

The chair suggested that using bubble plots would be helpful in examining year-class strengths.

It was clarified that the modelled indices for all gear types were presented for the central inshore area only as there were insufficient linetrawl data from the northern and southern areas and age disaggregated indices could not be produced for these areas. There was discussion of how the data were split geographically for the analyses. It was noted that in the past the split was done to conform with how the VPA was done. In the absence of a VPA, this split would not necessarily be required and might the information then have been split by division? The trends over time appear to be different in the 3 areas so it was agreed that the separation should remain. Also, it was noted that the current split into a northern, central and southern area was based on tagging information and this did not conform to NAFO divisions.

The Chair reminded participants that the ToR asked for information on a 'bay-by-bay' basis. He indicated that this could probably not be done but it was best to continue maintain the separation into 3 areas.

The Chair offered to carry out a FLEDA analysis of the 5½" gillnet data to examine relative year-class strengths. [This was added to a later presentation, titled: FLEDA Analysis – 2J3KL Surveys]

The Chair also indicated that the results from Sentinel work will have to be fleshed out more in the SAR this year due to the lack of a VPA.

Inshore Mobile Gear Survey

Presenter – Don Power (DFO – Science)

Presentation Title: Inshore Mobile Gear Survey 2006-2007 by Don Power and Rick Stead

ABSTRACT:

A bottom trawl survey of the coastal and nearshore 2J3KL area from 15 m to 200 m depth was conducted in 2006 and 2007 as a cooperative venture between DFO and the FFAW. These surveys were conducted using a stratified-random design with about 150 sets with the intent to cover the general area where the Stewardship fisheries of 2006 and 2007 was to take place – within the 12 mile limit – but only as far north as 53°N in 2J. The survey stratification was described as well as the fishing vessels (59' to 65' vessels), gear (Balloon 300 trawl with 40mm codend liner) and fishing protocols (30 minute tows at 2.5 knots). The analysis was split into northern, central and southern areas corresponding more or less to the same treatment of the 2J3KL inshore area for other indices in the assessment. The time series is too short to interpret trends in catch rates, but catches have generally been higher in the shallowest strata (< 50 m depth) and lowest in the northern area in both 2006 and 2007.Throughout the entire surveyed area, ages of cod caught ranged from 1-10 years, but ages 2 and 3 were most strongly represented, comprising about 70% of the numbers caught in each year.

DISCUSSION:

The presenter clarified that the terms 'S', 'C' and 'N' represent the approximate area where the stewardship fishery occurs. The 'SP', 'CP' and 'NP' areas are just seaward of these. Also the selectivity of the gear appears to be about 17 cm – 64 cm.

No overall summary conclusions were presented as the 2007 survey was only the second in the series. The presenter indicated that overall there do not seem to be any problems with the survey but more could be done with the results. There were some differences between the two years and the effects of large catches on the results are currently unclear.

There were differences noted with door spread, especially for one vessel, but the possible impacts are unclear at present. The data have been sent to an expert at the Marine Institute for evaluation but to date there has been no feedback. In this regard, having net monitoring equipment on board the vessels is proving valuable in providing detailed information on what the gear is doing.

A fisher questioned how far up the Labrador coast the survey goes. It was indicated that the survey only goes up the coast a portion of the way. There were very low mean numbers per tow in the 2J area surveyed. As was the case in 2006, the highest densities were in 3K. Also, lower densities were observed in the seaward strata in all three divisions.

It was reported that funding is again available so the survey should take place in 2008. Hopefully the same vessels will be available again.

The province indicated that they are contributing funding for this survey and would appreciate acknowledgement. The Chair indicated that this would be done in the SAR.

The Chair suggested that there might be a problem with large sets, especially with the smaller strata. The presenter agreed and suggested that there may be a need to revisit the stratification scheme. He indicated that it is difficult to stratify the shallower inshore areas.

The Chair suggested that with only two years of data it is a bit early to try and infer anything from the results. The densities seem lower in 2J than further south which is consistent with other information though. Also, there are lower densities seaward.

Some questions were posed regarding the selectivity of the gear given the slow towing speed. It is unclear how the slow speed (2.5 knots) may affect the catchability of cod, especially larger individuals. There was some recollection that during the 1997 inshore acoustic survey, a commercial vessel fishing along side the acoustic vessel did catch large cod. The towing details from that survey could be examined to see how they compare with the protocols used during this current survey series.

It was **recommended** that the towing protocols used during the 1997 inshore acoustic survey be compared with those used during the current inshore mobile gear survey in order to provide insights into possible selectivity/catchability issues with the current survey towing protocols. Further, it was **recommended** that the catch rates by vessel during the 2007 survey be compared since one vessel towed at a higher speed. This too may help in the consideration of selectivity/catchability with the current protocols.

An industry representative seemed to recall that the same gear was used for some surveys on the Scotian Shelf but that the tow speeds were higher.

Later in the assessment (Day 4), problems with the inshore survey were reported on. A further investigation of the vessel recording the 105 m doorspread revealed this vessel used heavier doors and was obtaining insufficient door spread towing at 2.5 knots with the standardized gear configured in accordance with the protocols. The skipper sought advice on the matter from a different supplier of the gear and was advised to use an additional 120 feet of groundwarp in the rigging. In addition, this vessel was also deploying 32 feet of door legs whereas the other vessels were using 6 feet. It was also noted that the skipper then towed this configuration at 3-3.5 knots in order to keep the doors upright and fishing properly. The end result of the faster towing speed, coupled with the different rigging of the trawl, is a much different swept area (perhaps double) compared to that of the other three vessels and therefore comparability is limited. Nevertheless, it was noted that the strata fished by the vessel were the most northerly strata in 3K and 2J where the lowest densities were found during the 2006 survey. In 2007, there were a total of 45 cod taken in only 8 of the 37 successful sets for this vessel. Consequently, although there is an unknown but upward bias in the 2007 estimates because of the swept area, the mean densities in the strata fished were lower in 2007 compared to the densities in the same strata in 2006.

An acoustic-trawl survey of offshore over-wintering northern cod

Presenter – Luiz Mello (MUN)

Presentation Title: An acoustic-trawl survey of offshore over-wintering northern cod, Feb-Mar. 2007 by L.G.S. Mello and G.A. Rose

ABSTRACT:

A dedicated hydro-acoustic/bottom-trawl survey was conducted during the winter 2007 covering the distribution range of northern cod off southern Labrador and Eastern Newfoundland (NAFO Divisions 2J3KL). The survey objectives included determining the distribution, abundance and biological traits of cod and the results indicated that most fish were found in two main regions adjacent to the Bonavista Corridor (NAFO 3KL) and Hawke Channel (NAFO 2J). The fish were highly aggregated at these locations and found in the demersal zone at depths ranging between 400-550 m. These fish were predominantly younger (3-5) and of smaller size-classes (24-55 cm), although several larger fish (70-87 cm) were caught in the Bonavista Corridor. The remaining areas were characterized by low abundance levels, including most of NAFO 3L. Biomass estimates (using acoustic data) over the surveyed areas ranged from approximately 2600-4000 t (3L and 2J respectively) to 17,000 t in 3K. The survey design and sampling strategy were effective in detecting fish and area coverage, and particularly suitable to assess cod abundance when most fish are found aggregated over small areas of the offshore.

DISCUSSION:

The authors indicated that there would be a research document produced that would detail the results presented. The presenter also provided preliminary information regarding dense populations found in the Bonavista Corridor during the recently completed 2008 survey. In response to a question from a fisher, it was noted that no estimate of biomass was yet available from the 2008 survey but once the analysis is complete an estimate will be available and will be presented at the 2009 assessment meeting.

A fisher questioned if many tows were done in Hawke Channel and what sizes of fish were caught. It was reported that due to ice, only a few tows were possible. The fish caught were relatively small with modes at 25 cm and 50 cm. A large aggregation was found in the area in 2008 but it also consisted of small fish. It was also pointed out that while an aggregation is usually found in the inner part of Hawke Channel; in 2008 another one was found in the outer part.

It was questioned whether there was any tagging work done. There were some attempts in 2007 but because of the cold water temperatures, the fish died. Some tagging was done during the 2008 survey on the heavy concentrations. Also, there were no tagged fish caught during the surveys.

It was questioned if the variability could be included with the estimates of biomass. Discussion of technical details then followed with it being indicated that the standard deviations of mean fish density were available and that high variability is common. Although the standard deviations could be related to biomass by multiplying by area, it would be nice if these calculations could be done and the information presented. There was also technical discussion concerning the derivation of standard errors and how these linked to the reported standard deviations. It was indicated that the means were not weighted by the variances when estimating biomass in the surveyed area. The chair limited questions about the technical details of the kriging method used, because of time constraints.

It was reported that in 2007 and earlier, the fish were found in deeper water (400 m) and their structure was not 'normal'. For the first time in 2008 fish were found shallower (300-350 m) which was more consistent with their historical distribution. Also, fish sizes had increased and the structure was more similar to that seen historically. The densities were also much greater in 2008.

A fisher questioned whether the biomass was going to be used to determine biomass in the RAP. The Chair responded that only the 2007 estimate would be used as the analysis of the 2008 data has not been completed. The 2008 estimate will be seen next year.

It was pointed out that this is only a 2-year program of research and is scheduled to end this year. One idea behind the project was to compare results from the current winter offshore acoustics surveys with those from acoustic surveys conducted offshore during the late 1980's. As such, it was suggested that these comparisons should be attempted.

Acoustic surveys of cod in Smith Sound

Presenter – George Rose (MUN)

Presentation Title: Acoustic surveys of cod in Smith Sound, Jan-Aug. 2007 by G. Rose and C. Knickle

WP Title: Acoustic surveys of cod in Smith Sound, Jan-Aug. 2007 by G.A. Rose and C. Knickle

ABSTRACT:

Acoustic surveys of the over-wintering cod in Smith Sound have been conducted in January or early February since the late 1990s to measure over-wintering biomass, following surveys conducted at various times of the year since April 1995. A revised survey method using a 42 ft. chartered vessel fitted with a hull mounted and calibrated 38 kHz Simrad split-beam transducer and EK500 echosounder was developed in 2006. In 2007, 22 surveys were run: the first on January 15th and the last on August 30th. All areas of the Sound with depths >100 m were surveyed (the minimum depth at which cod may be found during winter and spring based on our historical record). All data were integrated using Echoview software with Sa output in 100 m horizontal bins. Estimations of dead-zone Sa were made by extrapolating the mean bottom 5 m Sa over the estimated depth of the dead zone for each 100 m bin. As an example, the deadzone is approximately 1.56 m at 200 m using this acoustic system and setup. Interpolation of georeferenced data and estimation of mean density and variance over the full survey area was done using geostatistics and kriging (GS+ software). Three short fishing sets were made by the CCGS Shamook on January 15th, at locations selected by the acoustic survey. A total of 127 cod were caught and sampled by DFO Pelagics staff. Only results from the “over-wintering” 2007 surveys are reported here. On Jan. 15, there was no single dense aggregation of fish, the fish were pelagic in distribution and not in the over-wintering formation, hence the survey is not considered to be representative of or comparable to “winter” surveys in former years. The mean biomass was about 10,600 tonnes. Another survey was conducted on Feb. 6. By then, the cod were in a typical overwintering formation, comparable to former years, with densities reaching over 25 kg.m-2. However, the extent of the distribution was much reduced with total biomass estimated at approximately 14,500 tonnes (10,000-17,000 95% CIs).This overwintering biomass represents the lowest in the series since 1998. Preliminary results from 2008 suggest a further decline in overwintering biomass in Smith Sound. Possible reasons for this decline, including reversions of behaviour to more historically typical over-wintering and migration patterns are discussed.

DISCUSSION:

The presenter indicated that although the 2008 data have not yet been completely analysed, it appears that some fundamental changes in distribution patterns have been going on over the past few years. Although only speculative at this point, it might be that the fish behaviour is returning to historic norms.

A fisher questioned if the fish could be moving out of Smith Sound to feed. This could be happening but it was pointed out that the fish do not feed much at all during winter. When spring comes, some of the movement is related to spawning but once spawning is complete, it would relate to feeding. Some could survive remaining in Smith Sound but there is not enough food in the Sound for the entire winter population.

Some technical discussion of the survey design took place, particularly regarding the change in survey design. It was indicated that the desire is to have the fish stable and not moving around. It was back in 1997 that things were standardized to winter.

A question was posed as to whether the Smith Sound estimates could be compared with those from the offshore. They can be and for 2008, the fish densities offshore were similar to those in Smith Sound based on examination of parts of the data. It was reiterated that the densities found offshore in 2007 were much lower than those found during the 2008 survey.

There was discussion regarding the target strength estimates. In earlier years there were more length frequencies available to base target strength on but since 2006 the number of frequencies has decreased. Some are available from the Shamook if it is doing work in the area at the same time as the acoustic survey. It was considered that no other species would be involved in the estimates of target strength as no other species were ever caught during fishing.

The Chair suggested that the SAR report what the findings are and this would be an update with an additional point. Other than that, there doesn't seem to be any new message to give. The presenter responded that there is a hypothetical message at this point but he thinks things are changing. This may be good if the situation is reverting to the way things were historically. It is not clear at this point if this is happening but it is possible. The only other explanation for the observed declining trend is that the fish are gone but there is no evidence to support this.

It was clarified that the preliminary 2007 estimate for Smith Sound as presented during the 2007 RAP was incorrect due to a calibration error but this had now been corrected.

A fisher commented that he was not quite convinced that all of the fish had returned to Smith Sound since there were reports of cod in other areas (e.g., SW Arm) in January. Also, some fishers in the SW Arm area were catching cod in crab pots in April.

The WWF representative suggested that a recommendation be made to continue the acoustic work in Smith Sound as well as in the offshore given the changes that seem to be occurring in recent years.

A fisher indicated that from what he was hearing there is room for optimism and people should not leave the meeting assuming the status quo.

Migratory spawning behaviour of the Smith Sound cod aggregation: spreading the risk

Presenter – Brianna Newton (DFO – Science)

Presentation Title: *Migratory Spawning Behaviour of the Smith Sound Cod Aggregation: Spreading the Risk by Corey Morris, John Brattey, Brianna Newton, Robert Gregory, Danny Porter, Ryan Stanley, Paul Snelgrove and George Lilly*

WP Title: *Migratory Spawning Behaviour of the Smith Sound Cod Aggregation: Spreading the Risk. by Corey Morris, John Brattey, Brianna Newton, Robert Gregory, Danny Porter, Ryan Stanley, Paul Snelgrove and George Lilly*

ABSTRACT:

A large aggregation of large sized Atlantic cod overwinters in Smith Sound. Many of these "Smith Sound cod" migrated northward during spring in 2006 and 2007, as determined by the movements of sonically tagged cod (John Brattey, personal communication). Some sonically tagged cod were relocated during spring and summer in Bonavista Bay by manual sonic tracking; including several fish tagged in Smith Sound, two tagged near Twillingate, and one tagged in the offshore 3K. Handlining in the vicinity of acoustically tagged cod was conducted to examine length frequency distributions and cod maturity status. Plankton sampling was conduced during spring and summer near Smith Sound, Trinity Bay, and in Bonavista Bay. Our research suggests that Smith Sound cod spawn during migration, perhaps starting in Smith Sound but continuing while fish migrate north along the coast and into Bonavista Bay. Smith Sound cod thereby distribute eggs both spatially and temporally along the northeast coast, perhaps increasing the chances that some offspring survive.

DISCUSSION:

A fisher questioned whether there were differences in water temperature when fish spawned later in the year. It was noted that 2007 was a cooler year than 2006.

It was noted that work is ongoing to look at oceanographic factors to better understand dispersion and retention. It seems that the heads of bays are retention zones. Trinity Bay is 'simpler' so retention is not as strong there.

It was noted that there had been no analyses done to determine if the Smith Sound length frequencies were statistically different from the ones from Bonavista Bay.

A question was raised as to what the 'other' category was in relation to maturities. There refer to skip spawners or fish whose maturity could not be determined. It was suggested that discussions should take place with Joanne Morgan regarding how to handle these.

The Chair indicated that the information should be kept in mind when preparing the SAR.

Recruitment – Beach Seine

Presentation Title: *Relative strength of the 2006 and 2007 year-classes, from nearshore surveys of demersal age 0 – 1 Atlantic cod in Newman Sound, Bonavista Bay by Robert S. Gregory, Corey Morris, Brianna Newton, and Mary Ryan*

WP Title: *Relative strength of the 2006 and 2007 year-classes, from nearshore surveys of demersal age 0 & 1 Atlantic cod in Newman Sound, Bonavista Bay by Robert S. Gregory, Corey Morris, Brianna Newton, and Mary Ryan*

ABSTRACT:

We surveyed demersal age 0 and 1 Atlantic cod (Gadus morhua) in the nearshore (<10 m deep) from 1995 to 2007 using a seine net, to conduct a qualitative assessment of the strength of twelve 1995-2007 Atlantic cod year classes. Our assessment was based on abundance of Atlantic cod sampled at 6 - 13 sites, every 2 weeks from July until November, in Newman Sound, Bonavista Bay. Compared with a benchmark low abundance in 1996 observed in several pre-recruit studies in the waters off the northeast Newfoundland coast, age 0 abundance was 30 times higher in 1999 and 12 times higher in 2007. The 2006 age 0 abundances were the worst in the time series. As age 1 individuals in 2007, the 2006 year class continued to be very weak. Analysis of annual length frequency and abundance data indicated that age 0 Atlantic cod settled in the nearshore in two or more distinct recruitment pulses in "good years" – e.g., 1998, 1999 and 2007 - the first pulse arriving in early August, the second between late August and late September. In "bad years" – e.g., 1996, 2004 and 2006 – the first pulse was generally weak and late to recruit to the nearshore. In several years (e.g., 2004 & 2006), the first pulse appears to have been eliminated by the early autumn. The length frequency data in years following strong age 0 recruitment (e.g., 1999) also suggest that the pulse structure remains intact through the first winter, and is detectable in age 1 cod length frequencies the subsequent year. Newman Sound age 1 abundance correlated positively and significantly with age 3 estimates available from last year's inshore SPA (r2=0.803; p=0.0026). However, within Newman Sound itself, age 0 abundance appears to be a poor predictor of age 1 cod. We suggest that in years of very high abundance (compared to the decadal average 1996-2007), age 0 mortality (ranging 2-11 % d-1) has been higher than in other years, leading to lower abundances of age 1s the following year – dampening out the strongest recruiting cohorts.

DISCUSSION:

It was questioned how it could be predicted that there would be a strong 2007 year-class (based on age-0 information) but then state that age-0 survival and growth to the fishery are not well correlated. The presenter responded that the data indicate that when a strong age-0 is seen, there may be a strong age-1 but the age-0's don't correlate well with the age-3's in SPA whereas the age-1's do. There is a general pattern of similarity between age-0's and SPA age-3 but the relationship is not significant so it cannot be used as a predictor. The relationship with age-1's is significant so it can be used.

It was noted that white hake density was also measured and it appeared to be the second strongest in the series. As such, it was questioned if the prediction of the relatively strong 2007 year-class included consideration of hake predation. The presenter admitted he was 'sticking his neck out' with regard to his prediction regarding the strength of the 2007 year-class at age 1. He pointed out that hake is turning out to be a real problem for 0-group cod but after age 0 (for cod) there is no longer a hake predation problem.

It was clarified that the prediction of year-class strength was based on the pulse structure which seems to spread out the risk over time. Also, there was a broad base of recruitment that was spread out over 5 months and this has not been seen before. It is believed that the relative strength can be seen even after the hake 'has done its damage' in that Pulse 1 still has many fish late in the season. Nonetheless, it is still a prediction.

A fisher questioned whether hake showed up later in any other surveys. They are not as numerous as cod based on the juvenile work. Where they come from and go to is a mystery. It is unknown what happens to the 1-year olds. Perhaps they all die. Another fisher indicated that all he had ever seen were the small hake while another reported that he had never seen one in Trinity Bay. It was pointed out that the only known stock is in 3NO so the question remains as to where do they come from and where do they go.

Technical issues regarding interpretation of the progression of the various Pulses took place. It was pointed out that while high mortalities were inferred from the disappearance of certain pulses, whether the morality was due to hake predation or some other predation or cause is unknown.

The Chair questioned whether there might be a bit of a 'hole with Pulse 1 in 2007. The presenter responded that in 2004, the first pulse disappeared at a smaller size whereas in 2007 they were about 75 mm in October and beginning to move out of the eelgrass. He suggested the 2007 results are a sign of optimism but things will become clearer when information on age 1 is available next year.

The Chair summarized that for the SAR, there will not be a bullet this year about the strength of the 2007 year-class, but that the text will describe the situation regarding the age-0 (2007 year-class) fish. The SAR should also express caution in interpretation due to uncertainties regarding the predation issue. He indicated that the predation issue should also be mentioned in the Predator/Prey section of the SAR.

It was reported that work was done in 5 areas during 2007 (5 bays with 10 sites/bay, i.e., 50 sites). Although the data have not been worked up yet, juvenile fish were everywhere. It was suggested that this could also be mentioned as a broad-based observation in the SAR. It was questioned whether hake were found in the other sires. The data are pretty spotty but general information suggests that hake numbers are higher now than 10-15 years ago.

Tagging – reporting rates

Presenter – Noel Cadigan (DFO – Science)

Presentation Title: Tag Reporting Rates by Noel Cadigan and John Brattey

ABSTRACT:

In the 2007 assessment of northern (NAFO Divs. 2J3KL) cod it was noted that there was a substantial drop in tag reporting rates from tagging studies during 2006 in inshore areas of 3KL. This change in reporting rates had considerable influence on the estimates of exploitation rates.

We report on new analyses to estimate reporting rates in this presentation. The approach is similar to the one described in Cadigan and Brattey (2006); they used the high-reward method. A difference is that we only examine tag-returns from fish initially tagged with a single low or high-reward tag. This greatly simplifies the estimation procedure. Returns from double-tagged fish are not used. Since 2000, we have not used double tagging and only 15%

of recaptured tags in our data are from double-tagged fish. These can be ignored with much loss in estimation efficiency.

We estimate reporting rates using the proportion of low-reward tags returned from low and high-reward releases. We compute these by experiment, length class, recapture week and region. We use the common Binomial logistic regression model to estimate reporting rates. We fit this model with region and year effects. Some region and year cells have few returns, so we pooled data for some years. This approach yielded infeasible estimates in some regions and years, wide confidence intervals, and large between-year variability in some regions, especially those with less data.

We also considered another model in which we consider year-effects in log reporting rates to be random error terms, and region effects to be fixed parameters. This is a mixed-effects logistic regression model, with fixed ‘parameters’ and random ‘effects’. This approach did not produce infeasible estimates, gave narrower confidence intervals, and little between-year variability in reporting rates for most regions, especially those will less data. However, the estimates suggest a decreasing trend in tag reporting rates from 3KL, from 70-92% in 1997-2005, to 62% in 2006-2007.

Cadigan, N. G. and Brattey, J. 2006. Reporting and shedding rate estimates from tag-recovery experiments on Atlantic cod (Gadus morhua) in coastal Newfoundland. Can. J. Fish. Aquat. Sci. 63: 1944-1958.

DISCUSSION:

There was some technical discussion regarding analyses carried out for the 2007 assessment compared to the work for this assessment. There is still a drop in reporting rates in 2006, but upon reanalysis it was not as great as that estimated last year. As such, the adjustment to the estimated exploitation rate wouldn't be as high.

The important information is the estimate of only a 62% reporting rate for 3KL. This is down from 75%. That means that there is an estimated 40% not coming back and this is a concern because of the loss of information.

Fishers raised questions regarding the decline in reporting rates. One wondered if the change could have resulted from fish moving to areas where they are not caught. Another asked if the change could be due to the presence of more fish overall. A fisher inquired if the model was correct. Could it be that the fishers are not catching as many low reward tags as high? In response, it was explained that the tags are applied in a constant ratio. For various reasons, there may be fewer tags caught overall, but there should not be a change in the ratio. There was additional technical discussion regarding the estimates compared to those provided during the 2007 assessment. It was noted that the 2001 estimate seems to be an oddity and high. There does seem to be a declining trend thereafter. There are high variances but there is a trade-off between highly variable year-to-year estimates versus smoothing over what might be real differences.

A question was asked about the confidence intervals from the mixed-effects model estimates of reporting rates. The presenter replied that these confidence intervals are somewhat different than those we are used to seeing because of the random year effects. For example. very large sample sizes wouldn't reduce the standard errors to 'zero' since the variability of year effects are included. A better description of how to interpret these confidence intervals is required.

It was questioned whether it might be worthwhile to increase the proportion of high reward tags.

It was noted that information regarding source of returned tags (i.e., recreational or stewardship fishery) has been kept for the past few years. If the necessary information is not included with the return, then calls are made to get more details. The FFAW representative inquired as to what constitutes a return. Specifically, if information is missing, is it included? The presenter indicated that any return of fish within the length range used in the analyses in included. There are efforts to fill in the location and recapture time if this information is missing. There is only a small percentage returned with no recapture region identified. Also, there are many without the exact time of recapture but the month is provided. For the reporting rate analyses, it is only necessary to know the recapture-year which is reported for most tags.

A fisher commented that some commercial fishers may not return tags because they suspect that the quota will be affected. Also, many recreational fishers may keep the tags as souvenirs. The presenter agreed with the later point, noting that returns were a bit lower from the recreational fishery.

The Chair summarized that the gradual declines in reporting rates should be mentioned in the SAR along with what the implications might be.

Tagging – distribution, migration, and exploitation

Presenter – John Brattey (DFO – Science)

Presentation Title: *Exploitation rates and movements of Atlantic cod (Gadus morhua) in NAFO Divs. 3KL: tagging results from the fishery in 2007. by John Brattey and Brian Healey*

ABSTRACT:

This presentation gives results from tagging of cod in the inshore (and offshore) of 3KL during 2006 and 2007 and updates analyses presented at previous assessments. Approximately 10,400 tagged cod were released in 2006 and 2007, mostly inshore during April-early July and in November. Tagging was conducted in the Twillingate – Fogo area (3Ki), Bonavista Bay (3La), Trinity Bay (3Lb) and off the eastern Avalon (Petty Harbour – 3Lj during 2007 only). Offshore tagging was also conducted for the first time since the early 1990's, with approximately 1100 tagged cod released in southern 3K near the slope edge at depths of 430 m. Single and high-reward tags were used to estimate tag reporting rates. Minimum size at tagging was 45 cm and sizes of cod differed among areas. Mean length of cod tagged in 3Ki (~56 cm) tended to be smaller than those in 3La and 3Lb (68-85 cm); offshore cod were of similar size (54 cm) to those tagged inshore in 3Ki. Reporting rates were estimated (and presented by Cadigan at this meeting) for various regions and years using logistic regression analysis; estimates for inshore 3KL for 2006 and 2007 were 0.62 which is slightly lower than the estimates for this area in previous years (0.70-0.92). Exploitation rates for cod tagged in each region (unit area) and year were calculated, using an assumed value for the instantaneous rate of natural mortality (m) of 0.4 per yr for cod tagged in 3K and 0.2 for cod tagged in 3L. Tagging mortality and tag loss estimates were also incorporated. Average annual exploitation (harvest) rates for 2007 estimated from tagging were 6.6% for cod tagged in 3Ki, 6.6% for 3La, 5.8% for 3Lb, and 7.4% for 3Lj. Movement patterns inferred from the distribution of recaptures were consistent with our previous findings and indicated a central inshore area residency with movement among Trinity Bay, Bonavista Bay, and Notre Dame Bay; and some movement of cod between 3Ps and southern 3L. There were no recaptures from offshore tagging in 3K and it is suspected

that these cod suffered high mortality after release associated with the extreme depth at capture (430 m).

DISCUSSION:

1. Exploitation

It was clarified that for the 2007 assessment, M=0.4 was used for all areas. In the current analysis, 0.4 was used for 3Ki while 0.2 was used for 3La, 3Lb and 3Lj. It was also clarified that the weights used in the 2007 assessment to derive an average of exploitation rates from different experiments in a region were incorrect. In the 2007 assessment the weights were based on the total number released rather than the number of fish released in the 50 cm to 85 cm exploitable size range the tagging model is used for. In this assessment the correct weights were used; however, the choice of weighting had little effect on the average.

Fishers again raised questions regarding the return rates and the ratio of high reward to low reward tags, both applied and returned. The rationale for the different rewards was explained as were the details of the tag return implications in estimating exploitation rates. It was clarified that tags are also returned from experiments conducted in earlier years, although overall, the reporting rate has declined with time.

The Chair questioned why there was a cut-off at 85 cm. It was explained that there was an issue of selectivity in the returns. It seemed flat from 50 to 85 cm but then dropped off. Therefore fish >85 cm were excluded from the analysis. For the 2006 returns, about $^{1}/_{3}$ of the returns were eliminated as a result of this cut-off. A fisher indicated that fish >85 cm were more often taken with handlines than by gillnets. The presenter agreed and pointed out that if information from these larger fish was included, the overall estimates would be reduced since the fish are not available to most of the gear used (gillnets).

The Chair then emphasized that the SAR must be clear in explaining that the estimated exploitation rates are not for the entire population but are only for fish in the 50-85 cm range.

The Chair indicated asked for a plot of the average exploitation rate by release year. For example, for 2007, plot the exploitation rate as estimated from the 2004, 2005 and 2006 releases. If there is a trend then perhaps there is an issue with M but if things are generally flat then it would suggest that the M used in the model is appropriate. It was agreed that this would be done but that it could only be done for the 3Lb area.

A fisher suggested that there shouldn't be any concern regarding the low number of returns from earlier years since they didn't see many tags at all after the first year with lumpfish. In response it was pointed out that there were some questions regarding how well lumpfish retain tags. For cod, the retention is known to be good.

It was reported that for the central area, the returns from recreational/stewardship fisheries were 79/269 for 2006 and 66/462 for 2007. A fisher discussed the numbers returned from the stewardship fishery using gillnets compared to the returns from the recreational fishery which used handlines. He suggested that some further examination of these data may help explain the relatively low number of returns from the recreational fishery. The presenter agreed that to do this, and report the results to the meeting. [The results are given in the section New Analyses].

A fisher commented that many stewardship fishers are also recreational fishers and wondered if they may mis-assign the tags returned. It was agreed that this could be possible and if so, it would result in some differences.

The FFAW representative suggested that it might be useful to look at the sizes caught in the stewardship and recreational fisheries compared to the sizes tagged. It was pointed out that

any comparisons would be dependent on what sampling there might have been. There could be little or no sampling of the handline catches in the stewardship fishery for some periods but nonetheless, calculations could be done with the information available. There was additional discussion on how these analyses might be done. The modal catch length for gillnets is about 50-60 cm. The recreational fishery uses the same type of gear that is used for the tagging work so similarities would be expected. The only difference would be time-of-year.

The Chair suggested plotting length distribution of returns from the recreational and stewardship fisheries, restricting data used to the last 2 release years only. Also look at average sizes.

2. Movement/Migration

A fisher questioned if fish could still be in deep water if tags were applied there and there was little to no fishing in the area. This is a possibility.

The Chair summarized that the conclusions seem consistent with those of previous years with regard to migration. However, the discussion of exploitation is still open.

It was questioned whether the fact that some fish tagged in Smith Sound were recaptured in 3K which is not part of the central region could be problematic. There could be problems, but since there will not be an SPA, this shouldn't be an issue. It could matter with the Sentinel data – if the tagging data were showing differences from information from earlier periods then this would have to be considered. There could be fish from other components in all 3 areas. The Chair reminded participants that it has never been argued that the central area is Smith Sound fish alone.

Tagging – Telemetry Results

Presenter – John Brattey

Presentation Title: Northern cod (Gadus morhua) 16 years after the moratorium: new information from tagging and telemetry by John Brattey and Brian Healey

ABSTRACT:

A brief review of information on current and past views about northern cod stock structure was given, based on about 1000 recaptures of tagged cod from ~11,000 released in Smith Sound and adjacent areas since 1997. Historically, a large offshore cod population dominated the population and much of it migrated inshore seasonally. However, since the moratorium, the offshore components have been greatly reduced and recent tagging suggests there are 3 main components in the stock area: namely a relatively small remnant offshore population, a resident coastal component in southern 3K and northern 3L, and a migratory group that migrates into southern 3L seasonally from 3Ps. The advantages (and disadvantages) of newer telemetry methods versus conventional tagging were described along with some of the technical capabilities of the newer technology. Telemetry field work started in May 2005 with deployment of three receivers at the mouth of Smith Sound and release of 10 cod (>65 cm) inside the sound.

The technology worked perfectly and showed that all 10 fish left Smith Sound in May-June, one was subsequently caught, and the nine survivors returned to Smith Sound in October-November 2005. They over-wintered in Smith Sound and left again the following spring. Telemetry was expanded in 2005-2006 and 2006-2007, with an extensive series of receiver arrays deployed along the northeast coast extending across a 350 km inshore region from

Cape St. John in the north to Petty Harbour in the south. Approximately 100 cod with transmitters were released in Smith Sound in the winter/spring of 2005/2006 and again in 2006/2007. Departure times, return times, dispersal and survival were monitored using data downloaded from the extensive receiver arrays. There was a pronounced seasonal cycle in movements, with most cod leaving in spring and returning in late fall. About 10% of the cod with transmitters were caught in the fisheries in 2006 and 2007, but approximately 75% returned to Smith Sound the following winter. Dispersal data agreed with results from conventional tagging. Only 11.2% of the fish released in 2005-2006 that left Smith Sound were unaccounted for. Minimum survival was estimated at 78.6% after approximately 1 yr at liberty. Two of 147 cod released offshore in 3K during winter 2007 were detected on receivers moored inshore in Bonavista Bay and Trinity Bay during the summer of 2007 indicating they had migrated inshore.

DISCUSSION:

It was clarified that when indicating that 70 of 89 tagged fish survived to the end of January 2007, it meant that they were detected after January. It is the same for the 2006/07 releases. After January 2007, some of the batteries in tags applied during the first experiment begin to die so the sample size (n) dropped. Estimates are now difficult from data from this experiment as n is dropping over time. Overall, the results formed the basis for not using M-0.4 when estimating exploitation from the tagging data.

Sonic tags were only applied to 60+cm fish in the inshore and to 45+ cm fish in the offshore. The tags applied in the offshore were smaller and don't last as long.

The Chair indicated that it would be nice to know the average size of the fish with transmitters.

A fisher commented that in the Petty Harbour area they saw a tagged fish in the same area for about 3 months and they thought the fish was dead. However, it did move afterwards and the tags were detected in other areas. He suggested that based on this, some of the stationary tags in other areas may not represent dead fish.

A fisher from Labrador pointed out that there is no work being done in Labrador and more needs to be done in this area. There was agreement with this observation. It was pointed out that tagging off Labrador (Hawke Channel) was attempted but the fish died due to cold water. There is also a proposal to do work outside of Gilbert Bay and this has been funded so there will be some inshore work taking place. The Chair acknowledged that more work should be done in Labrador and considered the issue as 'point taken'. He indicated that the issue will be identified in the Proceedings.

A fisher commented that for years he had been hearing that the reason there is no cod inshore is that there are no fish offshore. He wondered if there is evidence of the fish moving inshore and off. There is no evidence at present although up until the last few years there were so few fish found offshore that tagging was not feasible. Now that concentrations are being found offshore, there is tagging taking place and return information should help to determine if offshore fish are influencing inshore catches or not.

It was explained that depending on the rate of transmission, the tags should last about 2 years. The battery life in the receivers is about 14 months. There were some problems with loss of receivers, especially off Cape Bonavista. As a result there are some holes in the data but these are not seen as causing major problems. Retrieving the receivers is time consuming work.

The FFAW representative wondered about the reliability of the transmitters. The reliability is not considered to be a problem based on the low estimates of mortality of the tagged fish. It

was then questioned if the mortality of the fish that were tracked is expected to be the same as for those around Fogo. Since the size distribution is greater in the central area, a lower M is suggested. Also, tagged fish disappear faster in the other area than would be expected for an M=0.2 and that is why M=0.4 was still used. The Chair indicated that there would be further discussion of M later.

Clarification was provided regarding the movement of fish past receivers. It was noted that the detection distance is about 1 km under good conditions. However, a fish could swim through a receiver array without being detected in bad weather. This needs further investigation. Also, in the bays receivers were placed inside the fjords and not across headlands. As such, the 67 fish that were detected moving past the Cape Bonavista receivers could have been in Bonavista Bay and not detected further, or could have moved offshore.

It was reported that based on the tagging information, fish could move from Smith Sound to Melrose in 1.5 days.

The Chair suggested that all of the information that is needed for the assessment has been extracted.

Fish Harvesters' Observations

Presenter – Keith Sullivan (FFAW)

Presentation Title: 2J3KL Fish Harvester Questionnaire by H. Jarvis, K. Sullivan, J. Pennell, D. Power, A. Tucker, L. Rideout, P. Rosa-Bian and J. Baker

ABSTRACT:

A telephone survey was conducted by the Fish, Food and Allied Workers Union (FFAW) to assess the opinions of fish harvesters regarding the abundance of cod in inshore waters, the size and condition of the cod, and the abundance of prey. Most harvesters in 2J felt cod were less abundant in 2007 than the late 1980's. However, most 3K and 3L harvesters felt cod abundance was better during 2007 than the late 1980's. Harvesters in 2J3KL found cod more abundant in 2007 than in 2006. Most harvesters felt that cod were distributed throughout their area and felt that cod were in good condition in 2007. As this survey continues, added utility can be derived by monitoring harvester's perceptions from year to year.

DISCUSSION:

A fisher commented that sounders on vessels have been used since the 1980's in the Petty Harbour area and most fishers in the area agree that if they had had traps in the water during 2007, they would have had the best catches since the 1960's. Another fisher who works in the 3KL area indicated that if he had been asked the same questions, he would have provided answers similar to those received as part of the questionnaire survey. As such, he considered the results credible.

The Chair questioned the information regarding tagging. Most seemed to indicate that they would return tags, but the actual return rates are much lower. The FFAW representative agreed there were conflicting messages. He suggested that the problem could be related to understanding the question and indicated that this could be looked at more closely. It was agreed that the main issue may be what people intend to do versus what they actually do.

It was also noted that it might be a good idea to consider asking questions about the high reward tags in the future as well.

Catch At Age and Logbook CPUE

Presenter – Eugene Murphy (DFO – Science)

Presentation Title: Cod catch in 2J3KL by Eugene Murphy and Brian Healey

ABSTRACT:

Catch in NAFO Divisions 2J3KL in 2007

Annual catch used in assessing the status of cod in NAFO Divisions 2J3KL is compiled from various sources. Information Management & Technology Services Branch provides estimates of catch from Canadian commercial fisheries. These estimates are compiled using Hail, Dock Side Monitor reports and logbooks from commercial fishers. Sentinel fisheries program provided information on sentinel catch by all participating in the program. Conservation and Protection Branch provides estimates of catch from Recreational / Food fisheries. Catches are compiled by gear, season, and location to discern changes in spatial trends.

These catches and sampling of fish length and age collected by Port Sampling, Observer Program and Sentinel Fishery Program are used to compile catch at age by various gears used in the fishery.

A directed stewardship fishery and recreational fisheries were re-opened in the inshore in 2006 and continued in 2007. In 2007 stewardship fishery catch was reported as 2364 t in addition the Sentinel Fishery took 182 t. The stewardship fishery catch was dominated by gillnet (73%) and hand-line (25%). In 2007 there were two estimates of catch from the recreational fishery. A telephone survey suggested a recreational catch that was comparable to the stewardship fishery catch; monitoring by fisheries officers suggested the recreational catch was much lower (371 t). The issues affecting the 2007 recreational catch estimation may also affect estimates for previous years. Until recreational catch is determined, total catch is uncertain.

DISCUSSION:

It was clarified that there were catches from both the 5½" and 3¼" gillnets but the catch from the smaller size was only 9 t.

The Chair, with reference to the lack of smaller fish in the 2007 gillnet catches, questioned whether catch by age and gear was available going back in time. The information from the past 5-6 years could be examined to see what has been going on. It was pointed out however, that there was no fishery between 2002 and 2006 so for those years only Sentinel data are available. Also, because of the filing system, it would take some time to dig out the information.

A fisher indicated that there was more slub in 2007 and wondered if this had been taken into consideration. Another wondered if temperature may be an issue. It was pointed out that these may affect catch rates, rather than catch-at-age. The Chair indicated that the slub issue should be identified in the SAR and that smaller mesh nets may have got dirty quicker so there would have been a bigger effect on their catch rates. From a Science perspective this could result in a year effect and it is important to record it now so that in a few years, if one might go back and re-examine things, and explanation will exist.

ABSTRACT:

Catch Rates from Vessels Less than 35 ft. Directing for Cod in NAFO Divisions 2J3KL in 2007

In 1997 when the directed fishery for cod in NAFO Subdivision 3Ps reopened it was made a condition of license that all vessels participating in groundfish fisheries would be required to complete and return a logbook. This requirement was new for the fixed gear less than 35 foot vessel sector and has been a requirement in all groundfish fisheries licensed in the Newfoundland and Labrador Region. Catch rates from these logbooks have become a source of information used to try and determine status of cod in the inshore areas of 2J3KL. Catch rates are presented as un-standardized median catch rates for gillnets and a series of standardized catch rates modeled to remove month (area) and year effects for both gillnets and linetrawl are presented.

Standardized gillnet catch rates declined from 1998 to 2002 when directed fishing was closed. When the fishery was reopened in 2006 standardized gillnet catch rates were similar to 1999, they increased in 2007 but were less than those experienced when the fishery reopened in 1998.

Standardized linetrawl catch rates are based on less data as this gear is not a major component of the inshore fishery in divisions 2J3KL. Catch rates decreased slightly from 1998 to 2002. Catch rates in 2006 when the fishery reopened where significantly higher than 1998 and increased again in 2007

DISCUSSION:

A fisher wondered why some logbooks are not being returned. It is not known why. It is considered by Science to be a FAM issue.

The standardization has not been run by regions although this probably could be done.

The median CPUE based on logbooks and Sentinel appears different but this could be due to the fact that the former is kg/net while the latter is numbers/net. There was further discussion of the technical aspects of the comparisons between the Sentinel (numbers) and logbook (weights) information.

The Chair suggested including similar information to that provided in the 2007 SAR and that wording should be developed to explain the observed differences.

The FFAW representative suggested that the differences seen in the southern area may be explained depending on what is the most reasonable estimate of the recreational catch. The Chair agreed and noted that the issues surrounding the recreational fishery catch would probably have more impact if it was also addressed in the Industry Perspectives section of the SAR. In the 2007 SAR there was a section on 'Additional Stakeholder Perspectives' where industry perspectives regarding the recreational fishery were highlighted. It was suggested that the inclusion of these comments may have been the reason the phone survey was done.

It was emphasized that the number one bullet in the SAR should be that the total removals from the stock are not known. The Chair indicated there will be a bullet noting that there are two estimates of recreational catch and the differences cannot be reconciled.

A fisher commented that the catch rates from the logbooks couldn't get much higher.

A research **recommendation** was made to investigate standardizing stewardship fishery catch rates by inshore assessment regions (INA, ICA, ISA). The comparability of stewardship fishery catch rates with catch rates from commercial fisheries in 1998-2002 should also be investigated.

OFFSHORE DATA

Autumn and Spring Multi-species survey (Biomass/Abundance)

Presenter – Eugene Murphy (DFO – Science)

Presentation Title: 2J3KL Multi-species Surveys by E.F. Murphy, K. Dwyer and N. Cadigan

ABSTRACT:

Canada has conducted research bottom trawl surveys in the autumn in divisions 2J, 3K and 3L since 1977, 1978 and 1981 respectively. No survey was in Div. 3L in 1984 however the results from summer (August-September) are used for assessment purposes. In addition Canada has been conducting spring surveys in division 3L from 1971-1982 and 1984-2007. These surveys are used to derive indices of abundance and biomass by division by season and for the stock as a whole. These surveys also allow the assessment to discern annual shift in population distribution as a whole and at age within the stock area.

In 2J abundance has increased in 2 of the past 3 years while biomass has increased in each of the past 3 years. Abundance in division 2J in 2007 is 4% 1983-1990 average and biomass is 1% average 1983-1990.

In 3K abundance increased from 2005-2006 and there was little change in 2007 while biomass has increased annually since 2005. Abundance in division 3K in 2007 is 9% 1983-1990 average while biomass is 12% average 1983-1990.

In 3L abundance and biomass has increased annually since 2005. Abundance and biomass in division 3L in 2007 are 11% 1983-1990 average.

Distribution plots show cod numbers to be higher in 2007 and more widespread. In 2004-2006 larger catches were found throughout the inshore, and also the area to the south and east of Funk Island Bank. However in 2007 no inshore sets were done but offshore catches were largest in the area to the south and east of Funk Island.

Distributions at age show that in 2004 few fish older than age 2 were evident in the survey since then the 2002 year-class can be tracked and in 2007 fish age 5+ were more evident in the offshore.

DISCUSSION:

The FFAW representative raised questions regarding the gear changes made in the surveys and wondered if more larger fish were caught with the gear used previously. It was pointed out that there was a gear change in 1995 and the results have been adjusted to account for the change in catchabilities of different sized fish. Nonetheless, no conversions were possible when there were 'zero' catches.

There was discussion surrounding the plots showing the distribution of the catches. In 2005 and 2006, there were no fish found in an area where they were found during the 2007 survey. This same area was not covered in 2004. It is not clear where these fish have come from. The issue is whether these fish suddenly appeared or if there has been year-class development over time. It seemed that in 2007, some year-classes suddenly appeared that hadn't been seen before.

A fisher questioned why there were no fishing sets inshore during 2007. It was explained that due to mechanical problems, overall coverage in 3K was reduced and time ran out. It was added that this is becoming more and more of a problem.

The FFAW representative asked for clarification as to what is considered 'inshore' for these surveys. It was described that 'inshore' is mostly within the bays but some of the 'inshore' strata are simply shoreward of traditional areas. There is nothing 'inshore' north of White Bay. Historically, these 'inshore' areas were not surveyed due to gear conflict problems.

It was pointed out that although the timing of the 2006 survey was late, the timing of that in 2007 was 'typical'.

FLEDA Analysis – 2J3KL Surveys

Presenter – Noel Cadigan (DFO – Science)

Presentation Title: FLEDA Analysis – 2J3KL Surveys by N. Cadigan.

ABSTRACT:

FLEDA is an R package, part of the FLR suite, for exploratory data analysis (EDA) of the data available for stock assessment. Some of these procedures (e.g. SPAY plots) were applied to the DFO 2J3KL autumn RV survey (offshore index strata), combined and separately for each Division, to the 3L spring DFO RV survey, and to the Sentinel catch rates-at-age for the inshore central area.

The results showed increases in survey catches for cod aged 5-7 in the autumn survey in 2007, corresponding to the 2000-2002 cohorts. The 2002 cohort has been consistently tracked by this survey since 2003, while the 2000-2001 cohorts appeared in the survey area starting in 2005 (ages 4-5), but more pronounced in 2006 and 2007. This was most notable in 3K, but also evident in 3L (spring and fall) and to a lesser extent in 2J. The 2002 year-class has also been relatively strong (i.e. pronounced) in the Sentinel gillnet 5 ½ mesh catch rates-at-age for the inshore central area; however, the 2000-2001 year-classes did not disappear in 2005-2006 in this Sentinel index, which we would expect if these years-classes moved offshore from the inshore central area.

DISCUSSION:

Explanations of some of the technical aspects of the analyses were provided pertaining to interpretation of the figures and how the scaling was done. It was noted that the analyses were done using data from the cod index strata only.

The presenter suggested that the question the analyses pose is whether the fish that are appearing in the offshore also ‘disappeared’ from the inshore. The results suggest that fish may be moving offshore, are distributing both inshore and offshore, or staying offshore more. This sort of interpretation is consistent with the decline over time in Smith Sound biomass based on acoustics, as well as the observation of less sonic tagged fish coming back to Smith Sound.

The sense is that the fish now being seen in the offshore had to come from somewhere since they are not born at age 5-6. The 2002 cohort has been consistently present over time but 2 others have appeared (2000 and 2001) in 2006 and 2007. This is consistent across results of examinations of bycatch in the turbot fishery, the acoustics work and the fall trawl surveys. It was noted that this phenomenon seems to also be occurring for turbot. The Chair suggested that people may wish to report these similarities.

Industry inquired as to whether the apparent appearance of year-classes might be due to differences in growth. It was explained that this would not be the case as the ageing is done based on otoliths collected in each year.

Discussion took place regarding the timing of the surveys in 3K as well as the coverage. It was reported that 3K is the area where there are the most difficulties regarding survey timing. It was agreed that the inconsistency in coverage and/or timing is causing some serious problems in interpreting the data. It was noted that this has been reported in the SAR's for the past number of years. The Chair suggested that perhaps a stronger message is required this year because it appears things are in a period of transition so it is more important to have good data.

A positive observation was that there are no signs of contamination of the 3L data with the 1997 or 1998 year-classes that were strong in 3Ps.

It was noted that there is no year-class strength model available but the Chair questioned 'why not?' indicating that a multiplicative model could be run based on the offshore research vessel data.

The Chair suggested that there may be a need to change the description of this in the SAR. Regardless, there is a need to say something. A recruitment plot is required for the SAR.

An overall **recommendation** arose from the discussions surrounding recruitment as follows: "It is **recommended** that there be an investigation carried out using a year-class strength model to summarize recruitment information from different sources (e.g., Sentinel, Beach Seine, Inshore Mobile)."

Mortality

Presenter – Noel Cadigan (DFO – Science)

Presentation Title: Total Mortalities by N. Cadigan

ABSTRACT:

Total mortality rates (i.e. Z's) in the offshore were computed using the DFO 2J3KL autumn RV survey (offshore index strata). Ages 4+ appeared to be fully recruited from cohort catch-curves. Hence, Z's were computed for ages 4-6, compared to ages 5-7 in the following year. The Z's mostly represent mortality in the following year because the survey occurs in the autumn. Z's were presented by age, and averaged two different ways. The first involved simple averages of the age-based Z's, and the second involved first summing survey catches by age, and then computing age-aggregated Z's. Results were similar for both methods of averaging.

Z's were high and fluctuated about 1 during 1995-2000, then increased further to 2 in 2003 – a very high level. Z's decreased since 2003 and the pooled average was 0.28 for 2007. Survey year effects in 2005-2006 produced negative Z's for 2006. This was mostly due to the increased abundance of the 2000-2001 year-classes at ages 5-6 in 2006 compared to 2005.

DISCUSSION:

The Chair indicated that the analyses suggested that the total mortalities have been declining since 2002. [Later in the meeting it was clarified that the Z's were for the 'next' year because the survey occurs in the autumn, so the decline was since 2003]. He noted that a highlight of the SAR in recent years has been the negative effects of high total mortality (Z) on recovery so if it is declining, it is a key point and must be considered carefully. He suggested that this decrease is another indicator that things are changing in a positive way.

A fisher commented that many of them recognize that there hasn't been much cod offshore but they are seeing cod offshore now. They don't know where it is coming from but they don't

believe it is from the inshore. In response, the Chair made reference to the declines observed in Smith Sound and suggested that there could be a couple of things going on; some fish moving offshore as well as better survival offshore. The result would be increases in both inshore and offshore areas. He agreed that there could not be a mass migration offshore since the inshore Sentinel catch rates were increasing.

The FFAW representative believed that the inshore abundance had increased and none moved offshore. He suggested this is supported by the fact that only 1 tag was found in the turbot bycatch. He indicated that fishers believe that the increase offshore is due to fish from areas not surveyed including across the Atlantic. The Chair pointed out that there is very little evidence to support such long distance migrations. He considered it reasonable to believe that the fish came from somewhere in the vicinity although he agreed there is very little evidence to suggest they are from the inshore.

RV Trends In Major Fish Functional Groups In 2J3KLNO

Presenter – John Brattey (DFO – Science)

Presentation Title: RV Trends In Major Fish Functional Groups In NAFO Divisions 2J3KLNO by Mariano Koen-Alonso

ABSTRACT:

The Newfoundland shelf ecosystem has suffered dramatic changes in the last 20 years. Among these, the severe declines in major commercial fish stocks, including the collapse of Atlantic cod, is one of the most outstanding features. However, these declines were not restricted to commercial species; many non-commercial fish also declined. We examined trends of major fish functional groups using simple indices (mean biomass per tow [B], mean abundance per tow [A], and their ratio [B/A]) based on research vessel (RV) surveys. The RV surveys considered are the DFO Fall Survey for NAFO Div. 2J3K (southern Labrador and northern Newfoundland shelf) and the DFO Spring Survey for NAFO Div. 3LNO (Grand Bank). These surveys follow a stratified-random design, however the design has changed over time (e.g. addition of inshore and deep-water strata), and not all strata have been effectively covered every year for operational reasons. A core set of strata was selected for this analysis; strata were chosen to provide a consistent spatial coverage over time. A major feature of these surveys is the gear change from the Engels to Campelen trawl between 1995 and 1996. Although conversion factors were developed for the main commercial species, there are no conversions available for the majority of species. This effectively splits the analysis of the time series into two periods, and earlier Engels series (1981-1994 in 2J3K and 1985-1995 in 3LNO), and a later Campelen series (1995-2007 in 2J3K and 1996-2007 in 3LNO). The functional groups we included were small benthivores (maximum size <45cm; 45 species), medium benthivores (maximum size between 45 and 80 cm; 34 species), large benthivores (maximum size above 80 cm; 29 species), piscivores (31 species), plankton-piscivores (8 species), and planktivores (14 species). There were major declines in B, A, and BA ratio in most fish functional groups during in the late 1980s and early 1990s. These declines were more severe in 2J3K than in 3LNO. Since 2002-2003, a general positive trend in biomass has been observed in 2J3KLNO. However, this trend is neither as general nor as clear in terms of abundance. The BA ratio also shows increasing trends in some 2J3K functional groups (piscivores and large benthivores), but no obvious pattern is observed for 3LNO. Overall, the fish community appears to be showing some positive indications, but biomass and abundance remain at a significantly lower level in comparison to the pre-collapse period. It is too early to know if these positive signals are the prelude of long term

recovery trends. At present, the drivers behind these signals remain uncertain but the extent of the patterns may suggest system-wide processes rather than stock-specific or local ones.

This presentation was prepared by the NEREUS program (NL Ecosystem Research Initiative). It is also part of the contribution of the NL Region to the Fisheries Oceanography Committee (FOC) 5-year Plan to develop Ecosystem Status Reports for the Atlantic ecosystems.

DISCUSSION:

The presenter noted that the purpose of this type of analysis is to move thinking towards broader ecosystem considerations. He clarified that the analyses as presented only included fish.

The Chair noted that there is an 'Ecosystem Considerations' section in the SAR, and some of the summary items presented should be included there.

The FFAW representative suggested that it would be nice to see something on species that are prey such as capelin and shrimp. He also inquired why the fall 3L data were not included. It was speculated that they were not included because data are not available for 3L over a long period.

It was suggested that it would be worthwhile to examine the data by division in addition to the survey totals as had been done. This suggestion was based on observations that some things had happened differently in 2J3KL and 3NO in the past. Also, in addition to looking at shrimp and capelin, a more detailed look at cod might be useful.

The Chair questioned whether there should be research recommendations and indicated that this possibility should be discussed in more detail later during the meeting.

Maturity Retrospectives

Presenter – Joanne Morgan (DFO – Science)

Presentation Title: Retrospective issue in maturity estimation by J. Morgan

WP Title: The retrospective issue with estimates of maturity for 2J3KL cod by M. Joanne Morgan

ABSTRACT:

Estimates of spawning stock biomass (SSB) for many populations are calculated by applying female maturity at age estimated on a cohort basis to total biomass. This means that until the age at which the maturation process is complete, estimates are based on incomplete data for a cohort. This results in potential changes in estimates of proportion mature at age from one assessment to the next. During the 2007 assessment of northern cod, concern was raised that this might introduce a retrospective pattern in SSB. The recommendation to carry out further examination of the maturity data and model, and to carry out comparative analyses for the next assessment was addressed. Models of proportion mature at age were refit to less and less data and the resulting estimates compared. SSB calculated using these estimates of proportion mature at age produced with differing amounts of data and a constant matrix of population numbers at age were compared to examine the impact of the method on both retrospective and projected estimates of SSB. As expected there are some differences between estimates of proportion mature at age for Div. 2J3KL cod, depending on the age range over which data were available. The magnitude of these differences varied from cohort to cohort. The impact of these differences in estimates of proportion mature at age on

estimates of SSB was relatively minor. The difference on projections was somewhat greater than the difference in retrospective analyses. In neither case were there differences in trend caused by the different maturity estimates (i.e. no cases where one set of maturity estimates resulted in an increase in SSB while another resulted in a decrease). The impact of the current method of estimating maturity at age for Div. 2J3KL cod appears to be minimal.

DISCUSSION:

During the 2007 assessment, it was "**recommended** to carry out further examination of the maturity data and model, and to carry out comparative analyses for the next assessment. There was also discussion surrounding the possible impacts of such a change in model estimates on the estimations of spawning stock biomass including retrospective patterns that would occur. It is only in retrospect that it is possible to determine which was more reasonable." This work was done in response to this recommendation.

The Chair expressed surprise that for the 1994 year-class, that maturity ogive could be inferred with so little data. It was pointed out that although the fit was not always as good as the one noted by the chair, reasonable fits were achieved with a very low percent mature. There was additional discussion of this and it was explained that GENMOD was used to fit the data. Also, the pre-1995 information was not used so there is no issue with the change in fishing gear. It was suggested that some of the observed stability could be due to the fact that data from all 3 divisions were combined.

Overall it was concluded that there doesn't appear to be a problem now. However, that does not necessarily mean there won't be problems with this stock in the future or with other stocks. The Chair noted that not much is being done with maturities in this assessment as there is no SPA.

The Chair then moved to a short discussion of research documents. He noted that there would be the main document and a tagging document that could contain the information on reporting rates. He suggested that the WP dealing with the maturity retrospectives should be upgraded to a research document. The research document will include an examination of the differences between the first and sixth fits and also include n-values.

Maturity

Presenter – John Brattey (DFO – Science)

Presentation Title: Maturity of Female Cod in 2J+3KL by John Brattey

ABSTRACT:

Maturities of female cod sampled during the autumn bottom-trawl survey of 2J3KL were determined using the same methodology as used in previous years, and the time-series of data now extends to the fall 2007 survey. A model is fitted by cohort to the observed proportions mature at age, and for cohorts with a significant intercept and slope, modeled estimates of proportion mature are output to a standard table along with cohort parameter estimates, and A50's (the age at 50% maturity). The results showed that the model adequately fitted the data up to the 2003 cohort and that the current A50 is close to the lowest in the time series (4.87) and is similar to the value for the 2002 cohort (4.88).

The addition of one more year of data to recent cohorts had little influence on the estimates for those cohorts from previous years.

DISCUSSION:

The presenter suggested that the key message is that the current age at 50% maturity is one of the lowest in the time series.

A fisher inquired as to why cod might be maturing at younger ages now. It was explained that there is quite a bit of literature on this. One explanation is that there has been a genetic change in the cod population. High mortality results in a selection toward fish that mature at smaller sizes. This is a big issue in fisheries science. What one would like to see is an increase again.

A fisher suggested that one would come to the conclusion that if they are spawning at earlier ages there would be more spawn because there are more younger fish. It was explained that there are a couple of issues involved. First, spawning is hard on the fish so survival may not be as good. Also, there is evidence that first time spawners are not as successful as repeat spawners.

The representative from the province inquired if the results of this work would be consistent with those from the acoustic surveys. It was noted that maturity information from those surveys had not been presented. Also, the 2008 information was only very preliminary.

The Chair indicated that the fact that the age of 50% maturity is still low should be included in the SAR although not necessarily as a bullet.

Growth and Condition

Presenter – Joanne Morgan (DFO – Science)

Presentation Title: Growth and condition by Joanne Morgan

ABSTRACT:

The lengths-at-age and weights-at-age of cod sampled during the autumn surveys confirm the general pattern of a decline in the 1980s and early 1990s as observed in commercial weights-at-age (Fig. 9). The research survey data (Tables 34, 35; Figs. 28ab, 29) illustrate that the changes varied with Division; there was a strong decline in Division 2J, a lesser decline in Division 3K, and little or no decline in Division 3L. The Divisional differences in mean lengths and weights are more apparent in Fig. 30, which focuses on changes in cod of ages 4 and 6. Superimposed on the long-term decline are periods of relatively quicker or slower growth associated with changes in water temperature (Shelton et al. 1999).

The trend toward low mean lengths-at-age and weights-at-age in the early 1990s has been reversed during the latter half of the 1990s. For example, in Division 2J, where the decline was the greatest, recent mean lengths-at-age have been at about the average for the 1978-2005 period (Fig. 28b).

Size-at-age has varied without trend in the past few years. Sample sizes at ages greater than age 4 have been very small since about 1992-1994 (Lilly 1998), so the accuracy of the estimates is likely to be poor.

Condition can be expressed in various formulations. One formulation is Fulton's condition factor (W/L3 * 105), where W is either the gutted weight of the fish or the liver weight in kg, and L is the length in cm. Arithmetic means by Division, year and age are presented for gutted condition (Table 36; Fig. 31) and liver index (Table 37; Fig. 32).

In Division 2J, both gutted condition and liver index declined in the early 1990s. During the second half of the 1990s gutted condition returned to approximately normal, whereas the

liver index improved but did not fully recover. There has been variability with little trend since the mid-1990s.

In Division 3K, gutted condition declined during the early 1990s and improved during the latter half of the 1990s. Liver index changed little during the 1990s. As in Division 2J, there has been variability with little trend since the mid-1990s.

In Division 3L, gutted condition has remained relatively unchanged over time whereas liver index increased considerably in the early 1990s and has since declined to an intermediate level.

The formulation of condition presented above is not independent of fish length. Therefore changes in condition at age can be the result of changes in mean length at age. The same gutted condition and liver indices as described above were calculated for each Division for 3 length classes (27-29 cm, 36-38 cm and 48-50 cm). In Division 2J and 3K gutted condition at length declined during the early 1990's and then increased to the levels observed prior to the 1990's. Gutted condition at length showed little trend over time in Division 3L. For Division 3K and 3L, liver condition increased up to the early 1990's, and since has shown no trend. In Division 2J, there is an indication of lower liver condition after the 1990's, particularly for bigger fish (Fig. 34).

Another way to examine condition without an effect of length, is to calculate relative condition (relative K). A length gutted weight regression was fit for each Division. The condition index is then observed condition divided by the condition predicted from the length weight regression for a fish of that length. Relative liver condition (relative LK) was calculated in a similar fashion using a liver weight length regression. Relative K and relative LK for each year were estimated for each Division using a generalized linear model with and identity link and a gamma error, with year as a class variable (Fig. 35 and 36). Both Division 2J and 3K show lower relative K in the early 1990's. There is little trend in Division 3L, but condition is estimated to have been high in 1995. The cause of this large estimate has not been examined. There was a significant year effect in for all three Divisions. Relative LK showed a decline in the late 1980's early 1990's in Division 2J. Relative LK subsequently increased but did not reach the levels of the early 1980's. Relative LK has increased in both Division 3K and 3L. In each Division there was a significant year effect.

The various methods of calculating condition show essentially the same patterns. In Division 2J and 3K gutted condition declined during the early 1990's and then increased to the levels observed prior to the 1990's. Gutted condition at length showed little trend over time in Division 3L. For Division 3K and 3L, liver condition has shown some increase. In Division 2J, there is an indication of lower liver condition after the 1990's.

DISCUSSION:

The presenter noted that the information was broken out by division as there could be differences between areas. She also noted that there could also be differences between different areas within any one division.

It was suggested that there could be an issue regarding age 4 being different sizes in different areas and therefore having different catchabilities. If, for example, all were >20cm, then would not be a problem. However it is an uncertainty that requires some additional thought. Also, if there were no changes in growth rates, this wouldn't be an issue. There is also the issue of catchability (q) not being constant over time.

The Chair questioned whether there should be a research recommendation on this. He suggested that if the selectivity of the Campelen is known, then this could be taken into consideration to adjust the mean numbers per age. If the selectivity is length based, what

might the implications be regarding age-based analyses? If no selectivity work has been done with the Campelen then there may be difficulties in doing this work. It was noted that the Norwegians have done selectivity work. This will be investigated further.

NEW ANALYSES

Further Tagging Examinations

Presenter – John Brattey (DFO – Science)

Presentation Title: Further Tagging Examinations by John Brattey

ABSTRACT:

Following two presentations I gave I was asked by the Chair to conduct some further analyses of the data and report results to the meeting.

I was asked to compute the exploitation rates for 3Lb for 2007 based on tags released in 2004, 2005, 2006 and 2007 separately. The purpose was to see if there was a trend in these estimates that might be related to selectivity; older fish are larger and may have moved beyond the main selectivity size of gillnets, so a trend might indicate that the estimates were being influenced by the size of tagged cod available for capture. The estimates were 4.4% (2004) 5.0% (2005) and 7.0% (2006). The value for 2007 was based on only seven recaptures. The results indicated only a slight trend that was not thought to be of major concern.

I was also asked to compute the number of tags reported as recaptured by commercial and recreational fishers for cod tagged and released during 2006-2007, with recaptures tabulated separately for each year. In 2006 there were 355 recaptures, 18% from recreational fishers and 82% from commercial (ratio 1: 4.6). In 2007 there were 186 recaptures, 22% from recreational fishers and 78% from commercial (ratio 1: 3.4).

I was asked to compute the mean length at release of tagged cod captured by commercial and recreational fishers in the past two years, based on cod released in 2006 and 2007 only. In 2006, there were 241 recaptures (209 commercial, 32 recreational) and mean lengths were 64.9 cm and 68.0 cm. In 2007, there were 149 recaptures (114 commercial, 35 recreational) and mean lengths were 64.9 cm and 67.7 cm.

I was asked to compare the gear types used by commercial and recreational fishers to catch tagged cod. Of 323 caught by commercial fishers, 255 were from gillnet, 25 from handline, 6 from linetrawl, and 37 from “other” gears. Of 67 caught by recreational fishers 51 were from hand-line and 16 from other gears.

DISCUSSION:

The slide showing the percent harvested from each tagging year did not suggest that the values of M used in the exploitation analysis presented earlier was too low as one would have expected to see higher exploitation based on recent releases and lower estimates from earlier releases. It was agreed that it might be possible to infer more after a few more years of data are available.

The ratio of tag returns (recreational to stewardship fisheries) was presented in a slide. These were 64:291 (1:4.6) in 2006 and 42:144 (1:3.4) in 2007.

The comparison of mean lengths at release of tagged cod recaptured by stewardship and recreational fishers in 2006 and 2007 suggested very little difference so there would be minimal impacts on estimates of exploitation. Also, it had previously been assumed that the

recreational fishery may have been catching smaller fish, but that has not been the case based on the tagging data. A fisher commented that in his area of Bonavista and Trinity bays, the sizes caught in the recreational fishery were smaller than those taken in the stewardship fishery. Another fisher observed that larger tagged fish may not have been caught in gillnets but could have been caught in the recreational fishery (hook and line). He suggested this could result in a larger mean size in the recreational fishery. Another fisher indicated that the recreational catches were of smaller fish in the Green Bay area. It was noted that the bulk of the recreational catch came from 3L.

The Chair suggested that the discussion would lead one to conclude that based on information on the sizes caught in the two fisheries, one could not conclude that there would be a difference in tag return rates.

There was overall agreement that more tagging work is required throughout the stock area.

The last slide showing a comparison of tag returns by different gear types in the stewardship and recreational fisheries generated considerable discussion. The Chair noted that while the return ratio of gillnet to handline in the stewardship fishery was about 10:1 (255 tags versus 25 tags), the catch ratio was about 3:1 (1736 t versus 591 t). He suggested this indicates that returns are either overrepresented with regard to gillnets or underrepresented with regard to handlines. The FFAW representative reminded people of the discussion earlier where it was considered that the selectivity of gillnets was such that they would catch more of the tagged fish.

Another uncertainty in interpretation of these return numbers pertained to situations when fishers may have handlined while the gillnets were fishing. It was questioned whether any recovered tags might be recorded as being from handline or gillnet. Although the information is supposed to be reported correctly, this may not be happening.

The Chair suggested that taking the data presented at face value, since they showed twice as many tags returned from the recreational handline fishery compared to the stewardship handline fishery, one might conclude that twice as much fish was caught. As such the recreational fishery estimate would be about 1000 t. A fisher agreed with this estimate. The FFAW representative pointed out that there was a higher proportion of the recreational fishery than the handline stewardship fishery in the area where tags were applied and this could affect the ratio of returns.

A fisher questioned whether tagged fish caught in cod pots would be included. They would likely be in the 'other' category.

Another fisher noted that there had been no tagging north of Twillingate so the information is only showing a picture for the southern area. The Chair agreed and indicated that this discussion would not be a part of the SAR but would be reflected in the Proceedings.

There was further discussion regarding details of the tagging information and what might be inferred from the information provided. The Chair finally suggested that while there were a lot of inferences being made based on the data, once one begins to drill down further into the details about the data, there are a number of issues that emerge that need to be addressed. For example, there are concerns about the return ratio between gillnet and handline in the stewardship fishery compared to the catch ratio. This may be due to the spatial separation between the different parts of the stewardship fishery but this is not clear. There is also a concern regarding the 25:50 return ratio between the stewardship and recreational handline fisheries.

The Chair also summarized, that based on the discussion, it was clear that a research recommendation is needed, and proposed the following: "There are substantial differences in

the ratio of tag returns from the stewardship and recreational fisheries, depending on gear type and possibly region. There are also differences in tag-returns between gear types that are inconsistent with aggregated landings information. It is **recommended** that work be done to try and resolve these differences. A starting point is to look at number of tag-returns by gear, in different fishing areas, and compare this with relevant landings-by-gear."

There were no other analyses to be re-examined so discussion moved to the drafting of bullets for the SAR.

SAR BULLETS

Discussion began with the first bullet in the 2007 SAR regarding biomass now compared to that of the early 1960's. It was questioned whether the statement was needed. It was concluded that since this information is already in the 'Context' section, it is not necessary in the bullet.

Discussion moved on to the bullet dealing with averages in the recent period compared to averages during the 1980's. It was clarified that the bullet about average biomass in the last 3 years compared to 1980's has been computed as follows: for the fall, average biomass 1983-1985 and 1987-1989 (i.e., the 1986 estimate is excluded) is compared to the average of the most recent 3 years. For the spring, the historic average is for 1985-1989. In both cases, averages are based on the converted data time series.

Work then moved on to bullets dealing with the 3 inshore areas. During this discussion, it was emphasized the word 'commercial' should not be used as this was a 'stewardship' fishery.

A fisher asked if there would be anything about the increase in the catch rate of cod in the turbot fishery. The Chair indicated that there would not be a bullet on this but it would be reported in the SAR.

It was pointed out that Sentinel was not mentioned in the 2007 bullet. The Chair indicated that for consistency, both Sentinel and stewardship catch rates should be mentioned in the bullet describing the southern area.

The Chair suggested that while the age-0's are looking good based on the beach survey information, it would be premature to mention them in a bullet so this should only be discussed in the SAR text.

There was discussion regarding what might be said regarding recruitment in the northern and southern areas. The Chair decided to 'park' the discussion on this until later.

A fisher questioned why the fish were assumed to be migrants in the northern area. This is assumed because there are no known over-wintering aggregations and there are no tag returns from the northern area. As such, they are assumed to be offshore fish. We have indicated that offshore catches should be minimized, and this should apply regardless of where they may be caught.

The Chair summarized that in the central area, catch rates are going up in both Sentinel and stewardship fisheries but there are indications of poor recruitment. A fisher questioned if the increase in cod bycatch rates in the turbot fishery should also be mentioned as part of the central inshore.

At this point (1700 Friday), a number of fishers prepared to depart for home. They inquired if they could get a copy of the SAR before it is released. While responding in the affirmative,

the Chair reminded participants of the confidentiality of the SAR until it is released to the public.

The Chair questioned whether the draft SAR could be sent out to everyone for comment prior to finalization. The RAP Co-ordinator indicated that this could be done but not using paper copies and mail because of time constraints. It was decided to email a draft to anyone who indicated they wanted to review the draft; however, they needed to give an electronic email address. The RAP Co-ordinator indicated that for the Shellfish SAR, a turnaround time of 48 hours was imposed. The Chair proposed that those wanting a draft copy of the SAR should let the RAP Co-ordinator know. Any additional changes to bullets would be highlighted for review in the draft.

The Chair expected the work in drafting the bullets to be completed Saturday and the SAR should be completed by the end of the following week.

Returning to the bullets, the chair noted that without catch information it is difficult to contemplate what might happen in the inshore central area as has been done in the recent past. For the offshore, it seems relatively easy to assume that the biomass is still below B_{lim}. Some status quo F projections could have been done based on the survey data but these are not available. The Chair suggested that these sorts of things were not done because DFO Science was expecting to have another SPA based on estimates of total catches similar to the past. Science did not anticipate the recreational catch issue.

It was agreed that something different needs to be said regarding the offshore since it appears that something different is happening. This was seen with the acoustics, bycatch in the turbot fishery and the lower estimates of total mortality. Some positive things are appearing.

The FFAW representative indicated that they did not want the SAR to suggest that the increases offshore were coming from the inshore. There was additional discussion surrounding this perspective. The apparent increase in catchability cannot be easily explained. Also, some year-classes seen in the 2007 in the offshore survey seemed to have appeared out of nowhere.

The Chair summarized that while the risk is probably reduced with regard to bay-by-bay fisheries, there won't be a bullet describing this. He also summarized that with the exception of the question regarding possible impacts of fishing at different catch levels, he felt that everything in the ToR had been addressed.

It was agreed that it is important to ensure that the fisheries management measures in 2005, 2006 and 2007 are described in detail in the SAR 'Context' section. It should be mentioned that the fishery re-opened and a stewardship fishery in 2006 involving IQ's only (i.e., no TAC's) whereas in prior years, when open, it was a quota based fishery. There was some discussion surrounding the reason why the fishery is called 'stewardship' rather than 'commercial'.

The discussions then focussed on development of the most appropriate wording for the bullets in order to best capture the key issues addressed and points made during the assessment.

During these discussions, the Chair emphasized that he did not want the SAR to focus on the recreational fishery and the differing catch estimates. He argued that the SAR is about 2J3KL cod status while the catch issue is one for FAM to resolve; it has not been a Science issue in the past. The Chair does not believe that RAP should arbitrate catches. He questioned whether the RAP's were going to move in this direction. The FFAW representative indicated

that the bullet dealing with this catch difference should indicate that the differences should be reconciled. The Chair indicated that the message should be 'this has to be fixed'.

It was questioned whether the phone survey would be repeated. This survey was conducted in direct response to the questions regarding the estimates of recreational catch raised during the 2007 RAP. The Chair suggested that the problems with the estimates are not just for 2007 but there are also questions regarding the estimates going back in time. This should be reflected in the SAR.

The Chair also noted that although the focus seems to be on the estimates of the recreational catch, there are fishers who suggest that the commercial/stewardship estimates are poor too. This however, does not get any focus.

There was additional discussion regarding the possible impacts of the inshore fishery on recovery in the offshore. Analysis suggests that the estimates of total mortality in the offshore declined with closure of the inshore fishery in 2002. Also, some industry people have suggested that the inshore fishery has hindered offshore recovery. The Chair suggested that this will remain an issue and nothing new can be said regarding the possible impacts of the inshore catches on offshore recovery.

The Chair reported that for the SAR, sources of uncertainty are supposed to be included in the section of the report dealing with the topic (e.g., catches), and should also be summarized in the Sources of Uncertainty section. In other words, they should appear twice.

He also emphasized that key words should be bolded in the bullets of the SAR.

Paper copies of many presentations were not provided. This proved to be inconvenient when reviewing summary bullets. The chair suggested that paper copies of the main assessment documents should be provided at future RAP’s.

The meeting concluded that some text should be added to the SAR indicating that if 2J3KL cod quotas are increased then the impacts on 3Ps cod of fishing in the inshore southern area should be considered.

Some participants felt that it is quite possible that fishing in the inshore has had negative impacts on the offshore component. However, it is difficult to prove this. A very plausible scenario was described. It was decided to describe this in the Management Considerations section of the SAR.

It was agreed that the ‘sudden’ appearance of the 2000-01 year-classes in the offshore should be described in the SAR. We have not seen strong evidence of a change in the age-compositions inshore consistent with these year-classes moving offshore. Also, there is a need to mention that the appearance of these year-classes is more pronounced in 3K.

It was agreed to describe in the SAR the year-classes observed in the ISA, and what stocks are they consistent with.

With regard to research recommendations, the Chair indicated that a specific discussion of possible recommendations will take place before the SAR is finalized. These will be recorded in the Proceedings. The Proceedings will also include a section on 'Progress on Previous Research Recommendations'. In addition, a memo will be sent to the Regional Director, Science describing the research recommendations arising from this meeting. It is presumed that a work plan will then be developed.

The Chair committed to sending the Proceedings out so that people can specifically see the progress section and the research recommendations arising from the RAP in addition to the

discussion sections. The Proceedings will not be sent to everyone, only to those identifying themselves as wanting to see the document.

In addition to review and revision of the provisional summary bullets, the draft text detailing the Industry/Stakeholder Perspective was discussed in plenary. The draft text pertaining to the latter was provided by the representative of the FFAW.

Seal predation may not be representative across the whole 2J3KL stock area. Consensus was to remove the reference to the seal predation from the industry perspective as this was not thought to be a concern throughout the whole stock area.

Harvesters believe that the increased cod abundance observed in the offshore, both in bycatch and the DFO RV survey was not heavily influenced by inshore cod.

An expansion of the harvesters' observations was requested, specifically the provision of more detail. This additional information would be valuable to understand the bases of the conclusions presented. The FFAW representative was requested to consult with the harvesting sector and re-evaluate a detailed expansion of the some of the statements provided.

The meeting adjourned at 1630 hr March 29th.

Appendix I – Terms of Reference

Meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Northern (2J3KL) Cod

Clovelly Golf Club, Stavanger Drive, St. John's, NL
March 26-28, 2008
and
E. B. Dunne Boardroom, Northwest Atlantic Fisheries Centre
80 East White Hills Road, St. John's, NL
March 31 - April 4, 2008

Meeting Chairperson: Noel Cadigan, Aquatic Resources Division, Science Branch, DFO, Newfoundland and Labrador Region.

TERMS OF REFERENCE

Context

The status of Divisions 2J3KL cod was last assessed in 2007. The current assessment is requested by Fisheries and Aquaculture Management to provide the Minister with detailed advice on the status of the stock.

Objectives

Full assessment of the stock status of the following resource will be reviewed:

- 2J3KL Cod

Specifically, the following objectives have been set:

- Assess the current status of offshore populations, inshore populations and the stock as a whole. In particular, assess current spawning biomass, total (age 3+) biomass, exploitation rate, natural mortality and biological characteristics (including age composition, size at age, age at maturity, and distribution). Describe these variables in relation to historic observations.

- Highlight major sources of uncertainty in the assessment, and where appropriate, consider alternative analytical formulations of the assessment.

- To the extent possible with available information, provide information on the strengths of year-classes expected to enter the exploitable populations in the next 1-3 years.

- Assess the implications to stock growth of inshore fishery removals varying from zero to 2500 t in 2008 and annually in the medium term (2008-2010). Implications are to be

assessed in terms of a risk analysis, specifically, the risk of the beginning of year SSB not meeting a growth rate of (0%, 5% and 10%) for inshore populations, offshore populations, and the stock as a whole where possible.

- Assess the implications of conducting an inshore fishery on a bay-by-bay basis.

In addition, an overview of ocean climate conditions during 2007, in comparison to the historical record, will be presented.

Products

A Science Advisory Report (SAR) and associated research document(s) will be produced. A Proceedings Report will record the meeting discussions.

Participation

The following participants are expected to attend:

- DFO Science, Newfoundland and Labrador and NCR
- DFO Fisheries and Aquaculture Management, Newfoundland and Labrador Region
- Industry Representatives
- Non-Governmental Organizations
- Fish, Food and Allied Workers Representatives
- Provincial Department of Fisheries and Aquaculture
- Memorial University

Appendix II – Agenda

Meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Atlantic cod in Divisions 2J, 3KL (Northern cod).

The Gazebo, Clovelly Golf Course
Stavanger Drive, St. John's, NL
March 26 – March 29, 2008

The following is a tentative agenda that may change as the meeting progresses.

Wednesday March 26

9:00-9:20 *Preliminaries* — N.Cadigan (Chair)
- Opening remarks
- Introduction of participants
- Terms of Reference (Objectives)
- Work Plan
- Reporting
- Comments on Agenda

9:20-9:45 *Overview of 2007 Commercial Fishery* — Penny

9:45-10:30 *C&P monitoring and compliance in the recreational and commercial/stewardship 2007 fisheries* — Burton

10:30-10:45 *Break*

10:45-11:30 *2007 Phone Survey of the NL Recreational Cod Fishery* — Phelan

11:30-12:00 *Overview of by-catch in the turbot test fishery.* — Knight

12:00-1:00 *Lunch Break*

1:00-1:30 *By-catch estimates* — Healey

1:30-2:10 *Catch and catch-at-age* — Murphy

2:10-2:45 *Oceanography* — Craig

2:45-3:00 *Brief Review of 2007 assessment* — Brattey

3:00 -3:15 *Break*

Inshore Data

3:15-4:15 *Sentinel Survey Overview Standardization Results* Maddock-Parsons

4:15-5:00 *Inshore Mobile Gear Survey* Power/Stead

Thursday March 27

9:00-9:40 *An acoustic-trawl survey of offshore over-wintering northern cod* Mello/Rose

9:40-10:15 *Acoustic surveys of cod in Smith Sound* Rose/Knickle

10:15-10:30 *Break*

10:30-11:00 *Recruitment – Beach Seine* Gregory

11:00-11:30 *Migratory spawning behaviour of the Smith Sound cod aggregation: spreading the risk* Newton

11:30-12:00 *Tagging- reporting rates* Cadigan

12:00-1:00 *Lunch Break*

1:00-2:00 *Tagging – distribution, migration, and exploitation* Brattey

2:00-2:30 *Tagging – Telemetry Results* Brattey

2:30-3:00 *Fish harvesters' Observations* Sullivan

3:00 -3:15 *Break*

3:15-4:00 Sequential Population Model (SPA) on Inshore Central Area Healey

Offshore Data

4:00-5:00 *Autumn and Spring Multi-species survey (Biomass/Abundance)* Brattey/Murphy

Friday March 28

9:00-9:30 *RV Trends In Major Fish Functional Groups In 2J3KLNO* Brattey

9:30-9:50 *Maturity* Brattey

9:50-10:30 *Maturity, Growth, and condition* Morgan

10:30-10:45 *Break*

10:45-11:15 *Mortality* Cadigan

11:15-12:00 *New analyses + summary bullets*

12:00-1:00 *Lunch Break*

1:00-5:00 *New analyses + summary bullets + SAR text*

Saturday March 29

9:00-5:00 *New analyses + summary bullets + SAR text*

Appendix III – List of Participants

Northern Cod Regional Advisory Process (RAP) 26-29 March 2008 Clovelly Golf Club, St. John's, NL

Name	Affiliation	Mailing Address	E-mail	Phone/Fax
Atkinson, Bruce	Rapporteur	St. John's NL	dbruce.atkinson@gmail.com	368-9982
Brattey, John	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	john.brattey@dfo-mpo.gc.ca	772-2891
Brodie, Bill	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	bill.brodie@dfo-mpo.gc.ca	772-3288
Burton, Ron	DFO, Conservation and Protection, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	burtonr@dfo-mpo.gc.ca	772-4494
Budden, Rodney	Fisherman	Box 8 Seldom NL		627-3439
Cadigan, Noel	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	cadigann@dfo-mpo.gc.ca	772-5028
Chafe, George	Fisherman/FFAW – Division 3L	Box 47 Petty Harbour NL		368-6118

Name	Affiliation	Mailing Address	E-mail	Phone/Fax
Craig, Joe	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	joe.craig@dfo-mpo.gc.ca	722-6015
Crocker, Pete	Torngat Fish Coop	PO Box 839 Station B Happy Valley Labrador A0P 1EO		896-3992 896-3336
Dalley, Cyril	FFAW- Sentinel	PO Box 178 Twillingate NL A0G 1Y0	cdalley@persona.ca	884-2689
Dwyer, Karen	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	dwyerk@dfo-mpo-gc.ca	772-0573
Fudge, Susan	WWF – Canada	TD Place, Suite 305 140 Water St. St. John's, NL A1C 6H6	sfudge@wwfcanada.org	689-3221
Gillis, Dave	DFO, Science, Ottawa, ON	200 Kent Street Ottawa ON K1A 0E6	dave.gillis@dfo-mpo.gc.ca	(613)991-6918
Glavine, Paul	Government of Newfoundland and Labrador	St. John's NL	paul.glavine@gov.nl.ca	729-3735
Goodyear, Julian	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	goodyearj@dfo-mpo.gc.ca	772-2027

Name	Affiliation	Mailing Address	E-mail	Phone/Fax
Gregory, Bob	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	Robert.Gregory@dfo-mpo.gc.ca	772-4491
Healey, Brian	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	brian.healey@dfo-mpo.gc.ca	722-8674
Higdon, Paul	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	higdonp@dfo-mpo.gc.ca	772-8368
Hurley, Kevin	DFO, Resource Management, St. John's. NL	Suite 200 4A Bayley St. Grand Falls A2A 2T5	hurleyk@dfo-mpo.gc.ca	292-5167
Ivany, Denis	Fisherman – Sentinel	Box 7875 Petley NL A5A 3O1		547-2452
Johnson, Albert	Fisherman/FFAW – Divsision 3L	PO Box 9 Little Catalina NL A0J	amjohnson524@hotmail.com	469-2062
Knight, Len	DFO, Resource Management, Eastern Area Office	Mount Pearl NL	knightl@dfo-mpo.gc.cs	772-5845
Mello, Luiz	Memorial University	Marine Institute PO Box 4920 St. John's NL A1C 5R3	luiz.mello@mi.mun.ca	778-0652

Name	Affiliation	Mailing Address	E-mail	Phone/Fax
Morgan, Joanne	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	joanne.morgan@dfo-mpo.gc.ca	772-2261
Murphy, Eugene	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	murphye@dfo-mpo.gc.ca	772-5479
Newbury, Glen	Fisherman/FFAW – Division 3K	Shoe Cove NL A0K 5G0	cgnewbury@hotmail.com	675-2506
Newton, Brianna	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	newtonb@dfo-mpo.gc.ca	772-6676
O'Connor, Mike	Icewater Harvesting	PO Box 89 Arnold's Cove NL	mcoconnor@eastlink.ca	(902)482-7747 (902)482-8142
Maddock Parsons, Dawn	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	parsonsda@dfo-mpo.gc.ca	772-7703
Phelan, Fred	DFO, Policy and Economics, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	phelanf@dfo-mpo.gc.ca	772-6931
Penney, Kim	DFO, Fisheries and Aquaculture Management, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	penneyk@dfo-mpo.gc.ca	772-2045

Name	Affiliation	Mailing Address	E-mail	Phone/Fax
Picco, Jennifer	FFAW	PO Box 46 Southern Hr. NL A0B 3H0	jenniferpicco@hotmail.com	463-2347
Power, Don	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	don.power@dfo-mpo.gc.ca	772-4935
Rideout, Rick	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	rick.rideout@dfo-mpo.gc.ca	772-6975
Richards, Dale	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	richardsed@dfo-mpo.gc.ca	772-8893 772-6100
Roberts, Everett	Fisherman/FFAW – Division 3K	Box 66 Triton NL A05 1V0	everett.roberts@nf.sympatico.ca	263-7265 263-2183
Rose, George	Memorial University, St. John's, NL	Marine Institute PO Box 4920 St. John's NL A1C 5R3	grose@mi.mun.ca	778-0482 778-0669
Rumbolt, Alton	Fisherman	Box 21 Mary's Harbour	alton@nf.sympatico.ca	921-6301
Stansbury, Don	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	don.stansbury@dfo-mpo.gc.ca	772-0559

Name	Affiliation	Mailing Address	E-mail	Phone/Fax
Stead, Rick	DFO, Science, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	rick.stead@dfo-mpo.gc.ca	772-0561
Sullivan, Keith	FFAW	2 Steers Cove PO Box 10 St. John's NL A1C 5H5	ksullivan@ffaw.nfld.net	576-7276
Tobin, Derek	DFO, Fisheries and Aquaculture Management, St. John's, NL	PO Box 5667 St. John's NL A1C 5X1	tobind@dfo-mpo.gc.ca	

Appendix IV – Presentations and Working Papers

PowerPoint Presentations and Working Papers

Brattey, J. Further Tagging Examinations. PowerPoint

Brattey, J. Maturity of Female cod in 2J+3KL. PowerPoint

Brattey, J. Northern (2J3KL) Cod: Review of the previous assessment March 2007 RAP (CSAS SAR 2007/018). PowerPoint

Brattey, J. and B. Healey. Exploitation rates and movements of Atlantic cod (*Gadus morhua*) in NAFO Divs. 3KL: tagging results from the fishery in 2007. PowerPoint

Brattey, J. and B. Healey. Northern cod (*Gadus morhua*) 16 years after the moratorium: new information from tagging and telemetry. PowerPoint

C&P Branch. Monitoring and Compliance: 2007 Cod Fisheries. PowerPoint

Cadigan, N. FLEDA Analysis – 2J3KL Surveys. PowerPoint

Cadigan, N. Total Mortalities. PowerPoint

Cadigan, N. and J. Brattey. Tag Reporting Rates. PowerPoint

Colbourne, E., J. Craig, C. Fitzpatrick, D. Senciall, P. Stead and W. Bailey. Physical Oceanographic Conditions on the Newfoundland and Labrador Shelf during 2007. PowerPoint

Gregory, Robert S., Corey Morris, Brianna Newton, and Mary Ryan. Relative strength of the 2006 and 2007 year-classes, from nearshore surveys of demersal age 0 – 1 Atlantic cod in Newman Sound, Bonavista Bay. PowerPoint

Gregory, Robert S., Corey Morris, Brianna Newton, and Mary Ryan. Relative strength of the 2006 and 2007 year-classes, from nearshore surveys of demersal age 0 & 1 Atlantic cod in Newman Sound, Bonavista Bay. Working Paper

Healey, B. By-Catch of Cod in Turbot Fishery. PowerPoint

Jarvis, H., K. Sullivan, J. Pennell, D. Power, A. Tucker, L. Rideout, P. Rosa-Bian and J. Baker. 2J3KL Fish Harvester Questionnaire. PowerPoint

Knight, M. 2004-2007 3LNO Turbot PP. PowerPoint

Maddock-Parsons, D. 2J3KL Cod Sentinel Index. PowerPoint

Maddock-Parsons, D. and Rick Stead. Sentinel Surveys 1995-2007: Catch per Unit Effort in NAFO Divisions 2J3KL. PowerPoint

Mariano Koen-Alonso, RV Trends In Major Fish Functional Groups In NAFO Divisions 2J3KLNO. PowerPoint

Mello, L.G.S. and G.A. Rose. An acoustic-trawl survey of offshore over-wintering northern cod, Feb-Mar. 2007. PowerPoint

Morgan, J. Growth and Condition. PowerPoint.

Morgan, J. Retrospective issue in maturity estimation. PowerPoint

Morgan, M. Joanne. The retrospective issue with estimates of maturity for 2J3KL cod. Working Paper

Morris, Corey, John Brattey, Brianna Newton, Robert Gregory, Danny Porter, Ryan Stanley, Paul Snelgrove and George Lilly. Migratory Spawning Behaviour of the Smith Sound Cod Aggregation: Spreading the Risk. PowerPoint

Morris, Corey, John Brattey, Brianna Newton, Robert Gregory, Danny Porter, Ryan Stanley, Paul Snelgrove and George Lilly. Migratory Spawning Behaviour of the Smith Sound Cod Aggregation: Spreading the Risk. Working Paper

Murphy, E. and B. Healey. Cod Catch in 2J3KL. PowerPoint

Murphy, E.F., K. Dwyer and N. Cadigan. 2J3KL Multi-species Surveys. PowerPoint

Penney, K. Northern Cod: 2007 Science and Stewardship Fishery. PowerPoint

Phalen, F. 2007 Survey of the Recreational Cod Fishery of Newfoundland and Labrador. PowerPoint

Power, D. and Rick Stead. Inshore Mobile Gear Survey 2006-2007. PowerPoint

Rose, G. and C. Knickle. Acoustic surveys of cod in Smith Sound, Jan-Aug. 2007. PowerPoint

Rose, G.A. and C. Knickle. Acoustic surveys of cod in Smith Sound, Jan-Aug. 2007. Working Paper

Appendix V – Progress on Previous Research Recommendations

From the 2007 RAP:

1. Concerns expressed regarding whether bias-corrected or uncorrected estimates from SPA should be used for projections. It was also pointed out that opinions differ regarding the handling of plus-groups. The Chair noted these issues and suggested that they would be better discussed during a Framework Meeting.

   It was therefore **recommended** that a Framework Meeting take place to examine the issue of bias correction, the handling of plus-groups and the lack of convergence of SPA.

   A Framework Meeting was not held during the intervening period. As such, there was no progress on this recommendation. These issues may not be as relevant now because SPA was not used in the 2008 assessment.

2. There was discussion on the way maturity data are treated and the modelling details. It was highlighted that the problem is that one is trying to fit a shape when the data are only available for half of that shape. The only way of knowing for sure is 'after the fact'. It was suggested that this could be examined in more detail, but that rapid changes could also be real. It was also agreed to use the information as presented for this assessment.

   It was **recommended** to carry out further examination of the maturity data and model, and to carry out comparative analyses for the next assessment.

   Thorough analyses were carried out to address this recommendation. Overall it was concluded that there doesn't appear to be a retrospective problem now. However, that does not necessarily mean there won't be problems with this stock in the future or with other stocks. It was noted that not much is being done with maturities in this assessment as there is no SPA.

Appendix VI – New Research Recommendations

1. In light of the problems with determining the most appropriate level of catch of 2J3KL cod, it was **recommended** that there be an investigation into the utility of catch-free assessment methods (e.g., Surba) for use in the ICA and offshore assessments.
2. It was **recommended** that the towing protocols used during the 1997 inshore acoustic survey should be compared with those used during the current inshore mobile gear survey in order to provide insights into possible selectivity/catchability issues with the current survey towing protocols. Furthermore, the catch rates by the vessels used in the 2007 survey should be compared since one vessel towed at a higher speed. This too may help in the consideration of selectivity/catchability with the current protocols.
3. It was **recommended** to compare results from the current winter offshore acoustics surveys with those from acoustic surveys conducted offshore during the late 1980's.
4. It was **recommended** that the acoustic work in Smith Sound as well as in the offshore be continued, given the changes that seem to be occurring in recent years.
5. It was **recommended** that standardizing stewardship fishery catch rates by inshore assessment regions (INA, ICA, ISA) should be investigated. The comparability of stewardship fishery catch rates with catch rates from commercial fisheries in 1998-2002 should also be investigated.
6. It was **recommended** that year-class strength estimates should be provided to summarize recruitment information for the three inshore regions, based on the Sentinel small mesh gillnet data and other appropriate data (e.g., Sentinel, Beach Seine, Inshore Mobile). Consider standardizing Sentinel small mesh gillnet catch rates using only younger ages that are reasonably well sampled by this gear. Consider using a year-class model.
7. Evidence was presented that suggested there have been some changes in growth rates for cod in the offshore portion of 2J3KL. If the catchability of the Campelen-survey is primarily length-based then changes in growth rates could affect age-based catchability for young fish or fish not fully recruited to the survey/gear. It was **recommended** that this should be investigated further. The selectivity of the Campelen trawl may not be known, causing difficulties in this regard.
8. There are substantial differences in the ratio of tag returns from the stewardship and recreational fisheries, depending on gear type and possibly recapture-region. There are also differences in tag-returns between gear types that are inconsistent with aggregated landings information. It is **recommended** that work be done to try and resolve these differences. A starting point is to look at number of tag-returns by gear, in different fishing areas, and compare this with relevant landings-by-gear."
9. It is **recommended** that Z calculations for the offshore be extended to earlier years.
10. Age composition information for the inshore southern area and 3Ps surveys reveal some very interesting patterns that may be related to stock mixing and substock structure. It is **recommended** that this be explored in more detail to better discern mixing in the inshore southern area.

Appendix VII – Recommended Research Documents

The Chair then moved to a short discussion of research documents. He noted that there should be 1) the main document and 2) a tagging document that could include the information on reporting rates. He suggested that the WP dealing with the maturity retrospectives should be upgraded to a research document. The research document will include an examination of the differences between the first and sixth fits and also include sample sizes (i.e. n-values).