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

**Compte rendu du processus de
consultation scientifique régional
(PCSR) de Terre-Neuve et du Labrador
sur le crabe des neiges**

March 3-5, 2008

Du 3 au 5 mars 2008

**Meeting Chairperson
Dr. Noel Cadigan**

**Président de reunion
Dr. Noel Cadigan**

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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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SUMMARY

A meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Snow Crab was held March 3-5, 2008 in St. John's, Newfoundland. Its purpose was to assess snow crab stocks in Divisions 2J3KLNO, Subdivision 3Ps, and Division 4R.

A Science Advisory Report (SAR) was written and reviewed in meetings from March 10 to March 11, 2008. It includes overall and division-by-division summary bullets written and reviewed at the RAP meeting. Detailed rapporteur's notes of discussion on each working paper presented at the RAP, in question-and-answer/comment-and-response form, were produced. This Proceedings Report includes an abstract and summary of discussion for each working paper presented, progress on research recommendations from the 2007 RAP and a list of research recommendations from this RAP, which includes those being carried forward from last year.

SOMMAIRE

Une réunion du Processus de consultation scientifique régional (PCSR) de Terre-Neuve et du Labrador sur le crabe des neiges a eu lieu du 3 au 5 mars 2008 à St. John's, à Terre-Neuve. Le but de la réunion était d'évaluer les stocks de crabe des neiges des divisions 2J3KLNO, de la sous-division 3Ps et de la division 4R.

Les participants des réunions des 10 et 11 mars 2008 ont formulé et passé en revue un avis scientifique (AS). Celui-ci présente des points sommaires concernant l'ensemble des divisions ainsi que chacune d'elles, lesquels ont été rédigés et passés en revue pendant la réunion du PCSR. Les notes détaillées prises par le rapporteur pendant la discussion concernant chaque document de travail présenté pendant le PCSR ont été rédigées sous la forme de questions/réponses ou de commentaires/réponses. Le présent compte rendu comprend un résumé ainsi qu'un sommaire de la discussion pour chaque document de travail présenté, fait état des progrès accomplis dans la recherche en regard des recommandations formulées pendant le PCSR de 2007 et inclut une liste des recommandations en matière de recherche, y compris des recommandations de l'an dernier qui ont été reportées à cette année.

INTRODUCTION

A meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Snow Crab was held from March 3-5, 2008 in St. John's, NL to assess snow crab stocks in Divisions 2J3KLNO, Subdivision 3Ps, and 4R. A Terms of reference, the agenda and lists of participants and working papers presented at the meeting are provided in Appendices I through IV, respectively.

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

Open discussion and debate proceeded during and after each presentation. At the meeting, consensus was reached on overall and division-by-division summary bullets of results of the assessment. These are included in the Science Advisory Report (SAR) written and reviewed March 10-11, 2008.

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

MEETING PROCEEDINGS

Presenter - D.R. Mallowney

Presentation Title: Development of indices of performance for the Newfoundland and Labrador Snow Crab fishery using a vessel monitoring system by D.R Mallowney and E.G. Dawe

ABSTRACT

This study investigates the potential for using data from a vessel monitoring system (VMS) to create indices of commercial fishery performance that may be used in monitoring resource status. Fishing hours were screened from hourly positional signals to create an index of fishing effort (hours fished) for comparison with that derived from logbooks (number of trap hauls). Similarly, a VMS-based catch per unit of effort (CPUE) index was developed for comparison with CPUE derived from logbooks. Analysis of these indices showed that VMS-based fishing effort and CPUE indices can be developed to provide reliable alternatives to logbook indices. The VMS-based indices have advantages of being available in real time and more objective and accurate than logbook-based indices. VMS data offer other potential applications for snow crab assessment and management. The approach and methods may be readily applicable to other commercial fishery resources worldwide that are monitored using vessel monitoring systems.

DISCUSSION:

Use of vessel monitoring system (VMS) data to develop an additional catch rate index was considered worthwhile. However, a number of factors possibly affecting the results that had not been considered in the analysis were identified. Smaller vessels tend not to operate during the night and drift. This would be interpreted as fishing time if the definition of fishing time is speed less than 3 knots. Also, depth of fishing, soak time, weather and breaks in lines could artificially extend fishing time. The possibility that a vessel could engage in more than one fishery on any given trip was also mentioned but considered to happen very infrequently if at all. While it was acknowledged that these could be contributing factors that had not been teased out of the data, it was pointed out that they are less of a problem if these effects are consistent from year to year.

It was suggested that inferences about the state of the resource from the efficiency of fishing, i.e., the number of hours fished, were tenuous. Catch per hour fished could underestimate CPUE if the resource is high and it takes a long time to clear out the traps for example. While there seems to be potential for distortion in the number of trap hauls per hour of fishing, the relationship between the number of trap hauls from logbooks and hours fishing from VMS is very tight.

This represents the first attempt to use VMS data this way and over time it should be possible to refine the measure of fishing time, however, the nature of the data is such that an absolutely precise measure is not possible. Overall, VMS tracks trends in logbook data very well and the intent is to keep it, independent of logbooks, as a separate index of effort.

It is recommended that this working paper be upgraded for inclusion in the CSAS research document series.

Presenter - D.R. Mallowney

Presentation Title: A comparison of spring and fall multi-species trawl surveys with respect to sampling snow crab and providing assessment indices by D. Mallowney, E. Dawe, E. Hynick, D. Stansbury, and G. Evans

ABSTRACT

This multi-faceted study compares spring and fall multi-species trawl surveys in NAFO Division 3L toward relating the quality of the spring survey index for assessment purposes in Subdiv. 3Ps, investigates migratory patterns of snow crab in 3L, and documents a depletion of the resource from deep depths in Divisions 3LNO. Trends in biomass from spring surveys reflect those in logbook CPUE more closely than fall surveys, but spring surveys catch fewer crabs, and subsequently yield lower biomass estimates than fall surveys. In the spring surveys in Subdiv. 3Ps, a predictive relationship is established whereby trends in exploitable crabs are preceded by trends in pre-recruit crabs by one to two years. An ontogenetic migration of male crabs is inferred from stratification by size and depth in the fall and a seasonal migration of male crabs from fall to spring is shown, with males being most commonly captured at deep depths in the fall and shallower depths in the spring. It is hypothesized that the fishery targets migratory exploitable crabs while they are at shallow depths, on harder substrates in the spring/summer, and that trawl efficiency is highest in the fall when crabs are most common on deep, muddy substrates. From the fall trawl survey, a depletion of crabs from deep depths of Div. 3LNO since the late 1990's is shown and predictions of future abundance are made.

DISCUSSION:

This presentation addressed four of the research recommendations from last year's RAP. This is the first time that logbook data were analyzed using STRAP. The analysis included all strata where fishing occurred in every year (i.e., common strata). The strata are the same as those used in the multispecies trawl surveys but the biomass estimates derived from the logbook data are not appropriately weighted by area. The biomass indices from the spring and fall trawl surveys are also from STRAP analysis.

It was considered that the resource contraction interpreted from the shifts in depth distribution of crab was more an overall reduction in abundance than contraction per se. The extent of horizontal movement implied by the changes in depth distribution indicated is substantially greater on the northern slope of the Grand Banks in 3L than in other areas where depth segregation by size appears to be more pronounced than in 3L. Similar work in the eastern Bering Sea has shown that movements in the order of 70+ km in a year are common for this species. Seasonal movements that account for the shifts in depth distribution occur throughout all divisions but it is only in Divs. 3LNO that spring and fall surveys are conducted and seasonal distributions can be compared. The situation in 3Ps area appears to be different than in 3L. In 3Ps crab are more highly concentrated in deep water channels where they are targeted by the fishery and seasonal movements appear to be much less extensive.

It is recommended that this working paper be upgraded for inclusion in the CSAS research document series.

Presentation Title: An Assessment of Newfoundland and Labrador Snow Crab in 2007 by E. Dawe, D. Mullooney, D. Stansbury, D. Taylor, E. Hynick, P. Veitch, J. Drew, G. Evans, E. Colbourne, P. O'Keefe, D. Fiander, R. Stead, D. Maddock Parsons, P. Higdon, T. Paddle, B. Noseworthy, and S. Kelland

ABSTRACT

Resource status was evaluated throughout NAFO (Northwest Atlantic Fisheries Organization) Divisions 2J3KLNOP4R based on trends in biomass, recruitment and mortality. Multiple indices of these metrics were derived from a suite of data sources that include dockside-monitored landings, fisher logbooks, observer monitoring, pre-and post-season trawl surveys, broad-scale post-season trap surveys, localized inshore trap surveys, a vessel monitoring system (VMS) and biological sampling data from multiple sources. The resource was assessed separately for offshore and inshore areas of each NAFO division, where appropriate (Div. 3KLPs4R3Pn). Data availability varied among divisions and between inshore and offshore areas within divisions. Data were insufficient to evaluate resource status in Div. 3NO and in offshore Div. 4R3Pn. The exploitable biomass has recently increased in the north (Div. 2J3K) due to increased recruitment. The exploitable biomass has declined and remains low in the south (offshore Div. 3L and Subdiv. 3Ps), but recruitment is expected to increase in the near future. The exploitable biomass has recently increased in inshore Div. 3L whereas it has declined in inshore Div. 4R3Pn and recruitment prospects are uncertain or unknown in these areas. Trends in indices are described in detail for each division and conclusions are presented with respect to the anticipated effects of short term changes in removal levels on fishery induced mortality.

Presenter – E. Dawe (Overview of snow crab in Divisions 2J3KLNO)

DISCUSSION:

Recruitment and exploitable biomass appear to have increased overall in recent years but this is being driven largely by increases in 3K.

Sampling by observers has improved over recent years generally and is adequate for some divisions in some years but certainly not in all cases. Coverage varies greatly by division from year to year but usually represents a small portion of the fishery. It was noted that observer data have been separated by inshore and offshore areas of each division for this year's assessment, in response to a research recommendation made in last year's assessment.

A great reduction in the prevalence of old and intermediate shell crab at pre-recruit and commercial sizes as well as a great reduction in the incidence of very small crab was noted in the annual size frequency distributions from the fall survey since 1998. This led to a consideration of age and time to recruitment for certain sizes. It was explained that crabs are thought to recruit to the fishery 7-8 years after settling on the bottom. At 40 mm carapace width (CW) crab are about 4 years of age and 5-6 years at 60 mm.

Presenter – D. Taylor (Division 3L)

DISCUSSION:

Some long-standing confusion regarding the presentation of shell condition data from observer samples was addressed. The observer catch rates of kept crab are from the set details and represent the total catch whereas the shell condition data come from a small sample of the catch.

In some areas the sum of shell conditions 2 (new-hard) and 3 (old) catch rates will not necessarily equal the catch rate of kept crab; however, the trends should match. Additional confusion arises when observer shell condition data are compared with data from research sampling which includes an extra category. A clearer presentation of these data would be helpful.

In 3L, the combined catch rate of shells of condition 2 and 3 matched the observed catch rate of kept crab. This implies that in this offshore area there were very few soft shell crab caught and only undersize crab were discarded. This suggests an absence of soft-shell crab in 3L. Substantial increases in the pre-recruit fishing mortality and exploitation rate indices from the fall survey were also noted and considered to indicate a diminished resource in the offshore area.

High-grading, which is sometimes invoked to explain the kind of discrepancies in observer data described above, increases the harvest of larger crab by releasing smaller commercial crab. The nature of the biological concern with the practice and whether harvesting the full commercial size range is in the best interest of the resource was queried. It was explained that the only biological concern with high-grading is the additional mortality associated with catching and releasing smaller commercial crab, which represents resource wastage. There is no evidence to suggest that harvesting the full commercial size range is more beneficial to the resource, but any such concern could be addressed by means of appropriate adjustments in the total allowable catch (TAC).

Changes were noted in the values of some survey indices presented last year. It was explained that these changes had resulted from a decision this year to include zero catches in the STRAP analysis which estimates biomass from the survey data. The entire series of estimates from the survey were adjusted accordingly. In addition, separation of data for inshore and offshore areas, as well as resolution of the problem associated with the reporting of some 3L landings in 3NO, resulted in changes in landings values since last year.

The sharp increase in the exploitation rate index for 2007 is partly explained by the sharp drop in the exploitable biomass index for 2006. The pre-recruit biomass index dropped somewhat in 2006 as well. It was noted that when biomass is low, small changes in values for biomass or landings can result in major changes in the calculated pre-recruit fishing mortality and exploitation rate indices.

Raw logbook CPUE was much lower than CPUE from the STRAP analysis of logbook data for the inshore area. There was no obvious explanation but it was suggested that this might be related to the use of survey strata which could have expanded the area fished inshore.

There has been a general decline in discards in the fishery in recent years. This could be attributed to changes in fishing practices, including the use of larger mesh traps, longer soak times and earlier fishing – these changes may have resulted in much less undersize and soft-shell crab being caught. This has compromised use of the observer discard rate as an index of recruitment. In previous assessments the discard rate has been used as a recruitment index but only in conjunction with the pre-recruit biomass index from the fall survey. These two indices don't always trend consistently. Considering the kind of changes that have occurred in fishing practice, the discard series has to be looked at very carefully.

The fall survey indicates that Bitter Crab Disease (BCD) tends to be broadly distributed in the offshore area and sampling from the fall trap survey in recent years indicates it is also broadly distributed inshore as well. High incidence is associated with warm periods and increased densities of small crab during periods of new recruitment moving through the population.

Presenter – D. Taylor (Division 3NO)

DISCUSSION:

Interpretation of the various CPUE series was the main focus of discussion for these divisions mainly because there is a great deal of confusion regarding shifts in the distribution of fishing effort and the effect on CPUE of the spatial restrictions imposed on the fleet by management boundaries in this area in addition to the economic considerations that influence choice of fishing location.

In recent years when fishing has been earlier than in the past, crab seemed to be distributed in shallower water and not in the traditionally-fished, deep-water area along the shelf edge. Fishing boundary restrictions at the 170 mile and 200 mile lines in the northern parts of management areas 3Lex(3N) and 3N200 prevent vessels that go to the area from fishing preferred grounds. Economic considerations related to the distances involved preclude making more than one trip to the area each season and the tendency is to go back to known fishing grounds rather than searching out better areas. In addition, prior to 2006 the fleet was required to take part of the TAC in 3O. Elimination of this restriction resulted in a shift in effort from 3O to better fishing areas in 3N.

Various CPUE series show lower values for the last 4 years than for the preceding 5 years. Opinion at the meeting was divided, however, on how this could be interpreted in terms of change in biomass. The fall survey in this area is unreliable for monitoring crab biomass. Some considered that the drop in CPUE values was artificial and misleading and should not be interpreted as a reduction in biomass. Others suggested it reflected a reduction in biomass within the areas fished. On the other hand, it was pointed out that there is a fair degree of similarity in the distribution of fishing effort in this area over the years and that the kind of changes in location of fishing described above is a problem inherent in the use of logbook data that applies to all areas. Therefore, it should be possible to offer an interpretation of changes in CPUE from the earlier to recent years. Consensus could not be reached, however, and it was resolved that trends in biomass are uncertain.

Presenter - D. Mullaney (Division 3Ps)

DISCUSSION:

Although landings were up somewhat in 2007, CPUEs were low and below the long-term average in both the inshore and offshore areas. Discussion tended to focus on interpretation of recruitment signals from observer and post-season trap survey sampling. Observer sampling was split by inshore and offshore areas for the assessment this year and it was noted that temporal coverage of the fishery was much better in recent years. Seasonal catch rate trends from observer coverage reflected the increased recruitment that had been expected in 2007 and size frequency distributions from both the observer and trap survey data show positive signs for the short term. Concerns were expressed that any increased removals in the fishery based on the positive signs of recruitment could adversely impact pre-recruits and impede further recovery or improvement in the fishery.

The spatial component of the new STRAP analysis of logbook data was explained. Fishing is assigned to 5 nmi x 5 nmi cells and mean CPUE values for each allocated to one of the survey

strata. It was pointed out that data from VMS on offshore vessels are much more complete and provide another new catch rate series.

Presenter - D. MULLOWNEY (Division 4R3Pn)

DISCUSSION:

It was noted that the index from the Gulf multi-species bottom-trawl survey included years in which the URI shrimp trawl was used. These years should be excluded because the URI trawl poorly sampled crabs. Also, the very high spike in the Campelen trawl catch in 2004, the first year it was used, needs to be investigated.

It was noted that the post-season trap survey covered the offshore of 4R only in 2003 and 2007. In the inshore, the only areas with common stations throughout the time series were Bay of Islands and Bonne Bay. It may be possible to get more out of this trap survey by looking at smaller unit areas.

Presenter - E. Dawe (Division 2J)

DISCUSSION:

Landings and CPUEs in the fishery have increased from lows in 2004-05 as a result of increased recruitment. However, the expectation of a decrease in recruitment was the primary concern and discussion focused on the likely timing and magnitude of its impact on the fishery, particularly in the context of possible changes to the level of removals in 2008. Even with increased landings in 2006 and 2007, the exploitable biomass index in the fall 2007 survey increased, which indicates continued good recruitment for the 2008 fishery. While it was considered important to communicate concerns about the fishery beyond 2008, it was difficult to formulate an appropriate statement because of uncertainty about future recruitment levels.

Old-shell crab made up a very small proportion of legal-size animals in both the trap and trawl surveys in the fall of 2007. This indicates that the fishery in recent years has been taking most of the available exploitable biomass and is therefore heavily dependent on new recruitment.

Comparisons of shell condition classifications from observer sampling during the fishery and from the fall survey sampling lead to the same extended discussion of the subject that is summarized in the **Discussion** for the Division 3L presentation. A new research recommendation was made to address the issue.

The apparent extensive overrun of the 2J quota is explained by the addition of landings from the exploratory fishing farther north in 2H and these should be removed from 2J landings. However, the question now is what to do with those 2H landings. Fishing in the north starts much later than in 2J and adding the northern area to the 2J crab fishery may not be desirable. There is pressure for a dividing line at 54° 40' which is south of the 2J/2H boundary at 55° 20'. Some difference in the resource (e.g., north and south of 54° 40') would be the most appropriate basis for any dividing line in the area.

Presenter - E. Dawe (Division 3K)

DISCUSSION:

Prospects for the fishery over the next several years remained promising although fishers expressed concern over any increase in removals for 2008 that would likely extend the fishery longer into the summer and impact soft-shell crab. However, it was pointed out that in the fall 2007 survey most of the exploitable biomass for 2008 is large crab that will only get old shelled if not harvested. CPUEs stayed high throughout the 2007 season and that is a good sign for 2008.

A departure in recent years from the general negative trend in the relationship between temperature and CPUEs in the fishery 8 years later was noted. It is considered too soon to suggest that the relationship is breaking down, but clearly, factors other than temperature are involved in crab recruitment. The environmental data are fairly precise; however, CPUE values don't necessarily track changes in crab biomass with the same precision, and year to year departures from the general trend in the relationship can be expected.

The STRAP analysis of logbook data needed clarification. It was explained that fishing was first assigned to a 5 nmi x 5 nmi cell and the mean CPUE was assigned to a survey stratum. There had to be fishing in at least one cell within a stratum and only strata common to all years were used in the analysis. A drawback to this approach is that it could exclude much of the data if the location of fishing effort is changing substantially from year to year. The present STRAP analysis excludes much of the data, especially for inshore areas, and is still a work in progress. A missing-data problem was identified in the stratum-by-year colored-coded plot (pg. 30 in WP); however it was reported that this problem does not affect the biomass indices. The raw logbook series will continue to be used for describing trends in CPUE.

Confusion associated with comparing shell condition classifications from observer sampling during the fishery and from the fall survey sampling was discussed again - this is summarized in the **Discussion** for the Div. 3L presentation. The question of bias introduced into the observer data when routine sampling is interrupted by implementation of soft-shell protocols was also raised. A new research recommendation was made to address the latter issue.

Changes in survey biomass indices since the last RAP due to inclusion of sets with zero catches was revisited. Although it had been thought that the exclusion of zero catches in the past had generally lead to higher indices, there was no consistency between divisions or over each time series in terms of higher or lower estimates with zero catches included or not. Including zero catches changed the number of common strata because of the requirement of at least two sets in a given stratum. Including zero catches adds strata but also lowers mean values for strata, so how that plays out in the biomass estimates will vary.

It is recommended that this working paper be upgraded for inclusion in the CSAS research document series.

Presenter - E M. Laurans

Presentation Title: Analyse des donnees de peche au crabe des neiges a Saint Pierre et Miquelon – Campagne 2007 Perspectives pour 2008 by M. Laurans et D. Briand

ABSTRACT: Not available.

DISCUSSION:

The St. Pierre-Miquelon crab fishery takes place in the narrow French corridor south of the islands. A sharp decline in landings is due to a reduction in the resource, but may also relate to a movement of crab into deeper Canadian waters in July.

St. Pierre-Miquelon fishers use the same traps as in Newfoundland. The smallest mesh size allowed is 115 mm but many voluntarily use larger, 130 mm mesh and find less work sorting the catch. There is a minimum legal size of 95 mm CW as in Newfoundland.

Presenter - C. Keats

*Presentation Title: Expanding the use of escape mechanisms throughout the Newfoundland and Labrador snow crab (*Chionoecetes opilio*) fishery by C. Keats, P. Winger and W. Hiscock*

ABSTRACT:

This presentation outlines recent activities pertaining to the distribution of snow crab (*Chionoecetes opilio*) escape mechanisms throughout Newfoundland and Labrador. During the past several months, a collaborative initiative was undertaken to raise awareness among harvesters about the utility of escape mechanisms in reducing the incidental capture of under-sized (sub-legal) snow crab. Nearly 3000 mechanisms were manufactured and distributed to several additional harvesters throughout the province as part of a controlled educational program. The number of participants has expanded from fourteen in 2007, to thirty-six for this upcoming 2008 fishing season. There is broad spatial distribution of these selectivity devices throughout the province, which includes NAFO Div. 3K, 3L, 3Ps and 4R. The increase of escape mechanism allocations for 2008 builds on the positive commercial results from previous years. These results are presented by means of a questionnaire of all 2007 participants.

DISCUSSION:

Although density of crab in traps was not tested in these experiments, at high densities escapement would certainly be impaired for small crab. The number of experimental traps used in the field trials varied between harvesters but it was usually fairly small and limited by the number of escape panels available for distribution. Some had lines dedicated to the experimental traps and others mixed them in lines with regular traps – deployment was at the harvester's discretion. The panels very effectively allow undersize crab to escape while retaining legal sizes.

There are not many of these escape panels in use at present so it isn't a factor affecting sampling by observers or the logbook data. However, if their use becomes prevalent throughout the

fishery, and especially if they are made mandatory, there will have to be sampling protocols for observers and corresponding adjustments to various data time series.

The shift to large mesh size in traps is something that will have to be considered as well. The better price for premium, i.e., larger commercial size crab, will drive the use of larger mesh in traps. Larger mesh allows smaller commercial crab to escape, however, many feel it is better practice to harvest the full commercial size range rather than concentrate on the largest. Use of smaller mesh traps with escape panels is considered by many to be a better way to go.

Progress on Research Recommendations from 2007 RAP

The research recommendations from the 2007 NL region snow crab RAP were:

1. Investigate the possibility of standardizing crab logbook data so that year-to-year comparisons of commercial CPUE as well as comparisons between fishery and survey indices can be made with greater confidence.
2. Investigate the gradual change to larger mesh size in crab traps from the logbook data.
3. Continue efforts to determine how to compute Confidence Intervals (C.I.'s) for time series of mean values and estimated population indices.
4. Investigate the separation of 3L observer data by inshore and offshore and the effect of changing fishing practices on indices from observer data.
5. Undertake to compare data from the fishery and the trawl survey in 3L on a stratum-by-stratum basis to further examine the mismatch between the distribution of fishing effort and the resource.
6. Undertake to investigate further the apparent disappearance of crab from the deep water strata of 3L over the fall survey time series.
7. In past years, some of the TAC for Div. 3O was not taken. Some of the management areas overlap for the Divisions 3NO and the landings need to be partitioned out. The landings sometimes exceed the TAC. Rather than separate out the two divisions, it could be looked at as one. As noted by a harvester, in the composition of the fleet, the amount of the quota in Div. 3O is somewhat outside and inside 200. This is confounded by the vessel class/size and the amount of catch per trip a vessel can take. This would require some work with the harvesters and Fisheries and Aquaculture Management (FAM). An attempt to resolve this issue as much as possible for the next assessment is advisable.
8. Generate year-by-strata biomass/abundance estimates for the slope/shelf edge area of Divisions 3LNO.
9. Compare the spring and fall 3LNO surveys. Relate this information in terms of quality of Subdivision 3Ps index.
10. Present observer data by inshore and offshore areas separately for each division in the next assessment.

11. Access data from the Quebec Region multi-species survey in Divisions 4RS for use in next year's assessment of 4R crab.
12. Attempt to develop a recruitment index from the observer at-sea sampling data from the relationship of CPUE with mean size of legal-sized crabs.
13. Define and present more clearly the index of pre-recruit fishing mortality.

Progress made for the 2008 RAP:

- Item 2: An analysis showed that there has been no trend in mean mesh size since such data were first recorded in 2001.
- Items 5, 6, 8 and 9: These were addressed in the WP: *A comparison of spring and fall multi-species trawl surveys with respect to sampling snow crab and providing assessment indices* by D. Mullowney, E. Dawe, E. Hynick, D. Stansbury, and G. Evans.
- Item 12: A working paper that attempted to address this research recommendation was withdrawn from the agenda for this meeting. An attempt was made to relate a good quality data set from an inshore research vessel time series with an observer sampling data series, but nothing has yet been found that could be applied to this year's RAP. However, investigators intend to continue the work and suggest that the recommendation be carried forward.
- Items 4 and 10: Where applicable, observer data have been separated by inshore and offshore areas for each division in this year's assessment.
- Item 11: Data were obtained from the summer multi-species survey conducted by Quebec Region and used in the 4R assessment this year.
- Number 13: An attempt was made in this year's assessment to define and present more clearly the index of pre-recruit fishing mortality.
- Number 7: An attempt has been made to sort out confusion with respect to 3NO TACs and reported landings. It was decided that in the future landings will be reported for Div. 3NO as a single unit. Also, any landings that were derived from 3NO but recorded as from Div. 3L (caught in the 3NO portion of Crab Management Area (CMA) 8B) will be reported against the 3NO TAC.

No progress on research recommendations 1 and 3 was presented at the 2008 RAP.

Research Recommendations from 2008 RAP

1. Carried forward from 2007 RAP. Investigate the possibility of standardizing crab logbook data so that year-to-year comparisons of commercial CPUE as well as comparisons between fishery and survey indices can be made with greater confidence.
2. Carried forward from 2007 RAP. Continue efforts to determine how to compute C.I.'s for time series of mean values and estimated population indices.
3. Carried forward from 2007 RAP. Attempt to develop a recruitment index from the observer at-sea sampling data from the relationship of CPUE with mean size of legal-sized crabs.
4. Carry out a spatial analysis of 3NO effort and CPUE data with a focus on developing a better index of stock abundance.
5. Investigate the very high numbers per tow in the 2004 Campelen trawl survey in 4R, compared to latter years.
6. Investigate the shell condition classification scheme used by observers in at-sea sampling to reconcile the confusion with groupings currently used in graphs of annual catch rates and size distributions by shell category and facilitate comparison with shell condition data from research sampling.
7. Compare STRAP analyses of CPUE data for all strata and common strata.
8. Investigate bias introduced into time series of observer shell condition data by changes to sampling protocols associated with high soft-shell incidence.
9. Investigate the possibility of breaking down observer discard data by size and shell condition using observer at-sea sampling data.

Recommended Research Documents

Development of indices of performance for the Newfoundland and Labrador Snow Crab fishery using a vessel monitoring system by D.R Mullaney and E.G. Dawe

A comparison of spring and fall multi-species trawl surveys with respect to sampling snow crab and providing assessment indices by D. Mullaney, E. Dawe, E. Hynick, D. Stansbury, and G. Evans

An Assessment of Newfoundland and Labrador Snow Crab in 2007 by E. Dawe, D. Mullaney, D. Stansbury, D. Taylor, E. Hynick, P. Veitch, J. Drew, G. Evans, E. Colbourne, P. O'Keefe, D. Fiander, R. Stead, D. Maddock Parsons, P. Higdon, T. Paddle, B. Noseworthy, and S. Kelland

APPENDIX I: TERMS OF REFERENCE

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

The Gazebo, Clovelly Golf Course
Stavanger Drive
St. John's NL
March 3-5, 2008

Northwest Atlantic Fisheries Centre
80 East White Hills Road
St. John's, NL
March 10-14, 2008¹

Meeting Chairperson: Dr. Noel Cadigan, Research Scientist, Groundfish Section, Aquatic Resources Division, DFO, Newfoundland and Labrador Region.

TERMS OF REFERENCE

Context

The status of Divisions 2J3KLNO, Subdivision 3Ps, and Division 4R snow crab was last assessed in March 2007. The current assessment of resource status is requested by Fisheries and Aquaculture Management to provide advice relevant to harvest levels for 2008.

Objectives

- Assessment of snow crab stocks in Divisions 2J3KLNO; Subdivision 3Ps; and Division 4R.

Products

A Science Advisory Report (SAR) and associated research documents will be produced for the snow crab assessment. A Proceedings document will record the meeting discussions.

Participation

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

¹ A second week has been planned to word craft the complete text of the SAR. Summary bullets for each stock will be agreed upon in plenary during the March 3-5, 2008 meetings. RAP participants are encouraged to attend the second week of discussions and assist in the drafting of the SAR.

APPENDIX II: CADRE DE RÉFÉRENCE

Réunion du Processus consultatif régional (PCR) de Terre-Neuve et du Labrador sur le crabe des neiges

**The Gazebo, Club de golf Clovelly
Promenade Stavanger
St. John's T.-N.-L.
Du 3 au 5 mars 2008**

**Centre des pêches de l'Atlantique nord-ouest
80, chemin East White Hills
St. John's, T.-N.-L.
Du 10 au 14 mars 2008²**

Président de la réunion : M. Noel Cadigan, Ph. D., Chercheur scientifique, Section des poissons de fond, Division des ressources aquatiques, MPO, Région de Terre-Neuve et du Labrador

CADRE DE RÉFÉRENCE

Contexte

L'état du stock de crabe des neiges des divisions 2J3KLNO, de la sous-division 3Ps et de la division 4R a été évalué pour la dernière fois en mars 2007. Gestion des pêches et de l'aquaculture a demandé la présente évaluation afin d'être en mesure de produire un avis sur l'exploitation de la ressource pour 2008.

Objectifs

- Évaluation du stock de crabe des neiges des divisions 2J3KLNO, de la sous-division 3Ps et de la division 4R.

Résultats

Un avis scientifique et des documents de recherche connexes seront rédigés concernant l'évaluation du stock de crabe des neiges. Les discussions tenues à la réunion seront consignées dans un compte rendu.

Participants

- Secteur des Sciences du MPO, Terre-Neuve et Labrador et RCN
- Gestion des pêches et de l'aquaculture du MPO, Terre-Neuve et du Labrador

² Une deuxième semaine a été prévue pour la rédaction de l'avis scientifique en entier. On s'entendra sur les points énumérés dans le sommaire pour chaque stock dans le cadre d'une séance plénière qui aura lieu durant les réunions du 3 au 5 mars 2008. Nous incitons les participants au PCR à assister à la deuxième semaine de discussions ainsi qu'à participer à la rédaction de l'avis scientifique.

- Représentants de l'industrie
- Représentants de la Fishermen, Food and Allied Workers Union
- Ministère provincial des Pêches et de l'Aquaculture
- Université Memorial
- Membres du public possédant des connaissances des pêches ou de la biologie du crabe des neiges

APPENDIX III: AGENDA

Meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on snow crab in Divisions 2J, 3KLNO, 4R, and Subdivision 3Ps.

The Gazebo, Clovelly Golf Course
Stavanger Drive
St. John's NL
March 3-5, 2008

Monday March 3 2008

9:00-9:30 *Opening- N Cadigan (Chair)*

Welcoming Remarks - *J Goodyear (RDS)*

Preliminaries:

Introduction of participants - *N Cadigan*

Terms of Reference

Work Plan

Reporting

Comments on Agenda

9:30-10:15 *Working Paper - D Mullaney*

Development of indices of performance for the Newfoundland and Labrador snow crab (Chionecetes opilio) fishery using data from a vessel monitoring system

D Mullaney and E Dawe

10:15-10:30 *Break*

10:30-12:00 *Working Paper - D Mullaney*

A comparison of spring and fall multi-species trawl surveys with respect to sampling snow crab and providing assessment indices

D Mullaney, E Dawe, D. Stanbury and G. Evans.

12:00-1:00 *Lunch Break*

1:00-3:00

Overview of snow crab in Divisions 2J3KLNO- E. Dawe

Division 3L - D. Taylor

3:00 -3:15 *Break*

3:15-5:30 *Divisions 3L+3NO - D. Taylor*

Divisions 3NO - D. Taylor

Tuesday March 4 2008

9:00-10:15 *Subdivision 3Ps- D. Mallowney*

10:15-10:30 *Break*

10:50 *Subdivision 3Ps (IFREMER) – M. Laurans and D. Briand*

11:15 *Division 4R- D. Mallowney*

12:00-1:00 *Lunch Break + talk*

12:30-1:00 *Update on the Expanding Use of Escape Mechanisms*

C. Keats, P. Winger, and C. Hiscock

1:00-3:00 *Division 2J - E. Dawe*

3:00 -3:15 *Break*

3:15-5:30 *Division 3K- E. Dawe*

Wednesday March 5 2008

9:00-10:30 *Finalization of provisional summary bullets for 3K (Offshore/Inshore)- E. Dawe*

10:30-10:45 *Break*

10:45-12:00 *Division 3K summary bullets (Cont'd.) - E Dawe*

12:00-1:00 *Lunch Break*

1:00-2:00 *Finalization of provisional summary bullets for 2J - E Dawe*

2:00 *New analyses/revisions for 3L/3NO - D. Taylor*

2:20 *New analyses/revisions for 2J/ summary bullets for 2J (Cont'd.) – E. Dawe*

2:40 *Finalization of provisional summary bullets for 3Ps - D. Mallowney*

3:00 -3:15 *Break*

3:15-5:30 *Finalization of provisional summary bullets for 3Ps (Cont'.d.) - D. Mallowney*

5:30-7:00 *Supper Break*

7:00-10:00 Finalization of provisional summary Bullets for 3L, 3NO and 4R – **D. Taylor and D. Mallowney**

Research Recommendations - N. Cadigan

March 10-11 2008

9:00-5:00 Finalize SAR text, at NWAFC.

APPENDIX IV: LIST OF PARTICIPANTS

Snow Crab Regional Advisory Process Meeting

March 3 -5, 2008

Clovelly Golf Club, St. John's, NL

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APPENDIX V: LIST OF WORKING PAPERS PRESENTED

- Mullowney, D.R., and Dawe, E.G. . Development of indices of performance for the Newfoundland and Labrador Snow Crab fishery using a vessel monitoring system. WP 2008/01.
- Mullowney, D.R., and Dawe, E.G., Hynick, E., Stansbury, D., and Evans. G. A comparison of spring and fall multi-species trawl surveys with respect to sampling snow crab and providing assessment indices. WP 2008/02.
- Dawe, E., Mullowney, D., Stansbury, D., Taylor, D., Hynick, E., Veitch, P. Drew, J., Evans, G., Colbourne, E., O'Keefe, P., Fiander, D., Stead, R., Maddock Parsons, D., Higdon, P., Paddle, T., Noseworthy, B., and Kelland, S. An Assessment of Newfoundland and Labrador Snow Crab in 2007. WP 2008/03.
- Laurans, M., and Briand, D. Analyse des donnees de peche au crabe des neiges a Saint Pierre et Miquelon – Campagne 2007 Perspectives pour 2008. WP2008/04.
- Keats, C., Winger, P., and Hiscock, W. Expanding the use of escape mechanisms throughout the Newfoundland and Labrador snow crab (*Chionoecetes opilio*) fishery. WP2008/05.