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**Région de Terre-Neuve-et-du-Labrador**

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

**Réunion du processus de consultation  
scientifique régional (PCSR) de Terre-  
Neuve et du Labrador sur le crabe des  
neiges et le pétoncle d'Islande**

**February 24-26, 2010  
St. John's, NL**

**Du 24 au 26 février 2010  
St. John's, T.-N.-L.**

**Meeting Chairperson  
Becky Sjare**

**Président de réunion  
Becky Sjare**

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**October 2011**

**Octobre 2011**

## **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 and Iceland Scallop was held February 24-26, 2010 in St. John's, Newfoundland. Its purpose was to assess snow crab stocks in Divisions 2J3KLNO, Subdivision 3Ps, and Division 4R and the Iceland scallop stock on St. Pierre Bank in Subdivision 3Ps.

Science Advisory Reports (SAR) were written and reviewed in meetings from March 1-5, 2010. They include summary bullets of results of the assessment for scallop and overall and division-by-division summaries for crab, which were 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 2009 RAP and a list of research recommendations from this RAP, which includes those being carried forward from last year.

## SOMMAIRE

Une réunion du processus de consultation scientifique régional (PCSR) de Terre-Neuve et du Labrador sur le crabe des neiges et le pétoncle d'Islande a eu lieu du 24 au 26 février 2010 à St. John's, Terre-Neuve. Le but de cette réunion était d'évaluer les stocks de crabe des neiges des divisions 2J3KLNO, de la sous-division 3Ps et de la division 4R ainsi que le stock de pétoncle d'Islande sur le banc de Saint-Pierre, dans la sous-division 3Ps.

On a formulé et passé en revue des avis scientifiques (AS) dans le cadre des réunions tenues du 1<sup>er</sup> au 5 mars 2010. Ces avis comprennent des points de sommaire concernant les résultats de l'évaluation du stock de pétoncle ainsi que des sommaires pour l'ensemble des zones et pour chaque zone de stock de crabe qui ont été rédigés et passés en revue au cours de la réunion PCSR. Le rapporteur a rédigé des notes détaillées sur les discussions tenues par les participants sur chaque document de travail présenté pendant le PCSR sous la forme de questions et réponses/commentaires et réponses. Le présent compte rendu expose le résumé de chaque document de travail présenté, le sommaire des discussions connexes et les progrès accomplis au chapitre des recommandations formulées dans le cadre du PCSR de 2009 ainsi qu'une liste des recommandations en matière de recherche tirée du présent PCSR, y compris celles de l'an dernier qui ont été reportées.

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## INTRODUCTION

A meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Snow Crab and Iceland Scallop was held from February 24-26, 2010 in St. John's, Newfoundland to assess snow crab stocks in Divisions 2J3KLNO, Subdivision 3Ps, Division 4R and the Iceland scallop stock on St. Pierre Bank in Subdivision 3Ps. Terms of reference, the agenda and lists of participants and working papers presented at the meeting are provided in Appendices I through IV, respectively.

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

Open discussion and debate proceeded during and after each presentation. At the meeting, consensus was reached on summary bullets of results of the assessment for scallop and overall and division-by-division summaries for crab. These are included in two Science Advisory Reports (SAR) written and reviewed March 1-5, 2010.

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

## WORKING PAPER ABSTRACTS AND DISCUSSION SUMMARIES

**Presentation title:** The Iceland Scallop in the Canada-France Transboundary Zone of St. Pierre Bank by D. E. Stansbury, E. Hynick and F. M. Cahill

Presenter – D. E. Stansbury

### Abstract

Directed fishing started in 1989 and peaked at 6000 t in 1992. Prior to 1996 the entire catch was taken by Canada. The decision by an International Court of Arbitration in 1992 resulted in jurisdictional changes over the disputed waters to the south of Newfoundland and St. Pierre and Miquelon. Following the decision, an annual catch level (TAC) was established for an area called “the Trans-boundary Zone” or simply the “CORE” France and Canada are allocated fixed percentages of the TAC at 70% and 30% respectively. Joint TACs were first established for the CORE in 1995 at 2800 t. However, less than 10% of the TAC was taken in any one year from 1995 to 1997. There has been no fishery in the CORE area since 1997 although there has been a TAC of 100 t in 1999-2000 and a 400 t TAC in 2001-2005. After the last assessment in 2006 the TAC was increased to 1,650 t. A Canadian research survey in September 2009 resulted in a minimum dredgeable biomass estimate of 2,900 t which was one third of the virgin biomass in 1990. The 2009 survey meat count of 68/500g was the highest in the survey series. The biomass estimate has increased since 2005, largely due to an increase in the French zone. Predatory sea stars were at their lowest level in the survey series in 2009. The natural mortality index for Iceland Scallop in 2009 was 12%, down from a high of 88% in 1998.

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## Discussion

Following rapid depletion in the early 1990s, the Iceland scallop resource in the commercial area on St. Pierre Bank was kept low by predatory sea stars, even with no fishing after 1997. The 2009 RV survey results showed there had been a very substantial increase in biomass of scallops in the core area since 1998. This was associated with a major decline in biomass of predatory sea stars and much reduced natural mortality. With the current low predator abundance, continued increase in scallop biomass can be expected.

In the early 1990s most of the biomass was in the French zone, but in 2009, 57% was in the Canadian zone. A 1650 t TAC has been in place since 2006. As a result of negotiations between the two countries in the 1990s, this is split 30%/70% Canada/France.

The immediate prospects for renewed fishing on this resource are poor. Prices are currently very low and the only Iceland scallop fishery in Newfoundland and Labrador Region that has been active in recent years is in the Strait of Belle Isle (4R) – it only supplies a small local market. Although the whelk fishery on St. Pierre Bank was closed July 25, there is interest among this fleet in fishing scallops in the area. This will be determined by economic considerations, but will likely be directed for sea scallops.

Industry prefers sea scallops and will target them before Iceland scallops at any rate, if that choice is available. Besides that, though, it's an especially poor time to consider renewed fishing on Iceland scallops on St. Pierre Bank. In the 2009 survey it was found that meat counts (#/500g) were appreciably higher than in the last survey in 2005 and the highest encountered in the survey series. This is due to an unexplained reduction in meat yield, i.e. individual meats were smaller for a given shell height. Poor feeding associated with some change in oceanographic conditions in the area in the recent past was suggested as a possible cause that could be pursued.

Sea star biomass was high during 1990-93, the first three survey years, when scallop biomass was highest and the fishery was underway. It is believed that scallop dragging leads to increased sea star biomass by creating much improved feeding conditions. They are attracted to an area when scallops are shucked at sea, and drags have a catching efficiency of about 20% damaging scallops not caught – this makes them more susceptible to predation by sea stars. Curiously though, sea star biomass remained high long after the decline in scallop biomass and fishing ceased. It was suggested that a connection with changes in oceanographic conditions might be involved in this as well. Estimates from surveys in 1996 and 1998 showed that sea stars inflicted very high mortality while their biomass was high. Mortality estimates based on the ratio of cluckers (dead scallops whose valves are still articulated) to live in the survey catches ranged as high as 88%.

Although not presented, it was revealed during the presentation that data are available on catches of small scallops in lined survey dredges on St. Pierre Bank. It was suggested that these be examined for recruitment signals in the future if possible. In contrast, however, scallops smaller than the legal size of 65 mm shell height are not caught in the survey in the Strait of Belle Isle, presumably because of a difference in substrate.

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**Presentation title:** Comments on the 2009 NL Whelk Fishery by D. Taylor, E. Hynick and D. Fiander

Presenter – D. Taylor

Abstract

A directed fishery for the Waved Whelk, *Buccinum undatum*, began in offshore 3Ps in 2004. The fishery grew rapidly, both in terms of landings and area fished. Landings peaked in 2008 at around 5800 t. This is a competitive fishery managed by quota and prosecuted by approximately 60 fishers using baited traps. Little is known about important parameters such as size-at-maturity, growth rates and fecundity. Available fishery data such as effort and landings are captured and summarized yearly, but at-sea observer coverage is poor. Available CPUE data indicate that catch rates have improved slightly over the last 3 years. Investigation aimed at determining the size at 50% maturity for both males and females was initiated in 2009.

Discussion

Catch and effort have increased in the whelk fishery on St. Pierre Bank since it started in 2004. CPUE has increased as well and appears to be supported by fleet movement rather than by new recruitment into fished areas. Whelks don't have a larval dispersal phase, development is direct. This could lead to localized depletion and some sort of area by area rotation of fishing may be an appropriate harvesting strategy.

The distribution of fishing effort looks to be clumped. This may be related to substrate type or to avoidance of gear used in other fisheries in the same area. Fishing is mostly within the 50 m contour where the substrate is pretty uniform. Whelks prefer rocky bottom rather than sand. They are preyed upon by sea stars but are much better able to avoid them than scallops.

A minimum legal size of 63 mm is currently in place. It is based on marketing considerations. In some places in Atlantic Canada, a size limit of 70 mm, based on biological considerations, is in place. In most places an increase in minimum size from 63 mm to 70 mm would have a very large impact on the fishery and would likely make it uneconomical to fish this species on St. Pierre Bank.

Science Branch is considering the possibility of undertaking the necessary biological sampling to determine size and age at maturity for this whelk species on St. Pierre Bank. This will provide the basis for a biological consideration of an appropriate minimum size in the fishery there. Aging whelks is fairly straightforward. The operculum is used and requires some preparation; however, there is some debate about where on the operculum to start counting. Male maturity is determined on the basis of penis length as a proportion of shell length and is much easier than maturity determination in females. In Nova Scotia a size limit based on size at maturity in males is being considered, but that is much less desirable than one based on female maturity. There are significant logistical problems associated with obtaining biological samples that will likely require cooperation with other groups. Sampling has to start in spring (1st week in April) before any females become spent and continue periodically through June. This poses a problem because the fishery doesn't start early enough. But, depending on prices, it's possible there could be some whelk fishing in early April. However, those who fish crab as well will normally catch their crab allocation first and

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target whelk late in April. If the problem of early samples can be resolved, it seems that the whelk fishery offers the best opportunity for the sampling required. However, there may be opportunity to obtain some samples before the whelk fishery starts through whelk trap deployment by crab fishers or on the spring RV survey in 3Ps.

Another problem is samples have to be kept alive. When samples are frozen, the ovary attaches to the liver and both tissue types degrade rapidly making it very difficult to remove the ovaries. However, whelks are quite hardy and withstand handling and transport well under cold, moist conditions. Processors require whelks to be landed alive. Fishing trips are limited to 5 days and whelks are kept onboard in ice. As long as shells are undamaged the operculum is quite effective in sealing and protecting the animal inside.

Although there has been a low level of coverage in this fishery, it may be possible to provide observers with coolers and have them collect samples, but samples for different fishing locations would have to be kept separate. This possibility should be pursued. The possibility of getting a group representing whelk harvesters involved in this should also be pursued through FFAW.

**Presentation title:** Investigation of factors affecting prevalence and distribution of Bitter Crab Disease in male snow crab along the northeast coast of Newfoundland by D. Mullaney and E. Dawe

Presenter – D. Mullaney

### Abstract

Bitter crab disease (BCD), caused by a parasitic dinoflagellate of the genus *Hematodinium*, is a source of mortality in Newfoundland and Labrador snow crab. Patterns of disease prevalence and distribution have been spatially and temporally variable since its discovery in 1990, while factors and mechanisms controlling for prevalence and distribution of infection remain poorly understood. This paper examines data from a long-term trap survey in two bays along the northeast coast of Newfoundland to investigate potential influences and interactions of a variety of biotic and abiotic factors. The factors examined are size, temperature, salinity, depth, and host density. We conclude that density of small to intermediate-sized crabs is the factor directly regulating prevalence and distribution of BCD in snow crab, with all other factors having either indirect or no influence. The study further considers the impacts BCD can exhibit over the commercial fishery, and we investigate the ability of BCD to accurately predict intermediate to long term recruitment to the fishery.

### Discussion

At present there is no basis from trap or trawl surveys for a prediction of long-term recruitment. This study shows it is possible to use the incidence of BCD in male crab <76 mm CW as a predictor of future (mid- to long-term) recruitment to the fishery. BCD incidence in small crab is density dependent and high prevalence provides a signal of strong recruitment.

The usefulness of BCD incidence as an indicator of future recruitment is based on small crab. While small-mesh traps catch small crab fairly well, the efficiency of traps and trawls for catching small crab can change and signals are often mixed. Incidence of BCD is independent of catching efficiency and provides a biological indicator or signal of recruitment that can be used to clarify other indices. A high incidence of BCD in small crab provides an

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indication of a strong recruitment signal. This study is focused on catches of small-clawed, adolescent male crabs in small-mesh traps in DFO trap surveys in White Bay and Notre Dame Bay. While data from all strata have been combined in this analysis, it is recognized that shallower strata may be more conducive to BCD. Also, there are shallow to deep movements of crab in this area possibly involving oceanographic effects that could be confounding the analysis. Although localized, the study area extends into the offshore area of 3K and it is suggested that the relationship between BCD and recruitment described has broad implications.

**Presentation title:** An assessment of the physical oceanographic environment in NAFO Divs. 2J 3KLNO during 2009 by E. Colbourne, J. Craig, C. Fitzpatrick, D. Senciall, P. Stead and W. Bailey

Presenter – E. Colbourne

### Abstract

The North Atlantic Oscillation index for 2007-09 was slightly above normal (<0.5 standard deviation (SD)) and as a consequence, outflow of arctic air masses to the Northwest Atlantic was stronger than in warm years of 2004-06. This resulted in a broad-scale cooling of air temperatures throughout the Northwest Atlantic from West Greenland to Baffin Island to Labrador and Newfoundland relative to 2006. Sea-ice extent and duration on the Newfoundland and Labrador Shelf increased in 2009 but remained below average for the 15<sup>th</sup> consecutive year, although it was the most extensive since 1994 during the spring. As a result of these factors, local water temperatures on the Newfoundland and Labrador Shelf generally cooled compared to 2006 but remained above normal in some areas in 2009. Salinities in general on the NL Shelf, which were lower than normal throughout most of the 1990s, increased to the highest observed since the early 1990s during 2002 and have remained mostly above normal during the past 8 years. In particular, at Station 27 off St. John's, the depth-averaged annual water temperature decreased from the record high observed in 2006 to about normal in 2007 and to about 0.4 SD above normal in 2009. Annual surface temperatures at Station 27 also decreased from the 64-year record of 1.7°C (3 SD) above normal in 2006 to about 0.7 SD (0.4°C) above normal in 2009. Bottom temperatures at Station 27 were slightly below normal in 2009. From 2004-06 Station 27 bottom temperatures were >2.5 SD above normal but decreased to about 1 SD above normal in 2007-08. Upper-layer salinities at Station 27 were above normal for the 8<sup>th</sup> consecutive year. The area of the Cold-Intermediate-Layer (CIL) water mass with temperatures <0°C on the eastern Newfoundland Shelf during 2009 was below normal (0.4 SD) for the 15<sup>th</sup> consecutive year while off southern Labrador it was above normal by 0.6 SD, the largest since 1994. Bottom temperatures on the Grand Banks (3LNO) during the spring of 2009 were above normal by <1 SD. During the fall bottom temperatures in 2J and 3K were above normal by up to 1.5 SD while in 3LNO they were about normal. The area of bottom habitat on the Grand Banks covered by <0°C water during the spring decreased from near 60% in 1991 to <5% in 2004 but increased to near-normal at about 30% in 2007-09. In conclusion, water temperatures on the Newfoundland and Labrador Shelf have decreased from the record highs of 2006 but remained above normal in most areas during 2007-08. In 2009 they decreased further with some indices showing negative anomalies. A composite climate index derived from several meteorological, ice and oceanographic time series indicate a peak in 2006 that have decreased in recent years with 2008 ranking 6<sup>th</sup> warmest and 2009 ranking 34<sup>th</sup> in 60 years of observations.

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## Discussion

There are three oceanographic transects off Labrador, three off the northeast coast and three off the south coast of Newfoundland that are sampled several times annually. The Seal Island and Bonavista transects are presented here to represent Labrador and Newfoundland, respectively. Station 27 is located 2 nautical miles off Cape Spear. It is occupied opportunistically as RVs leave and return to port, usually 3-4 times per month throughout the year. There are no oceanographic moorings at Station 27, a vertical profile is taken when the station is occupied. Station 27 data provide a good indication of seasonal changes in the inshore branch of the Labrador Current.

The oceanographic database includes data from all inshore and offshore RV trips and these are utilized in oceanographic indices depending on how data are sorted.

The annual and decadal cycles within the multi-decadal, long-term climate outlook (AMO) indicate there is currently a short-term cooling trend within an overall long-term warming cycle. This recent short-term cooling is expected to bottom out at a relatively high level. During the current cold period, oceanographic conditions have not been nearly as cold as during the early 1990s, and as a result some of the earlier strong correlations between temperature and crab abundance have weakened.

The long-term climate outlook index is a composite of a number of different indices. Correlation matrices show that all of the various indices of meteorological and oceanographic conditions are inter-related and are basically telling the same story.

Climate change is a relatively recent phenomenon and the extent to which it is part of the current multi-decadal warming cycle or how it will affect these cycles in the future are unknown. For next year's RAP, it was suggested that in addition to this overview of physical oceanography, a similar overview of biological oceanography, as was presented at last spring's cod ZAP, be considered.

**Presentation title:** Exploratory Snow Crab Survey, NAFO Division 2H, 2009 by J. Coffey, D. Mullaney, J. Snook, G. Brothers and E. Dawe

Presenters – J. Snook and G. Brothers

Abstract Unavailable

## Discussion

The survey was carried out in the area of 2H where there is a 100 t quota. Catch rates were low, the catch was dominated by large, mostly old-shell crab and taken mostly in the SE corner of the survey area. There is very little sign of any recruitment. However, this trap survey provides the only information available for 2009 because there was no trawl survey in 2H last year.

A survey was conducted in the area back in the 1980s with low catches of crab at that time as well. However, a fall trap survey 4-5 years ago had much better catches which included lots of new-shell crab. These data should be in the DFO database.

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**Presentation title:** An Assessment of Newfoundland and Labrador Snow Crab (*Chionoecetes opilio*) in 2009 by E. Dawe, D. Mullowney, D. Stansbury, E. Hynick, K. Skanes, P. Veitch, E. Colbourne, P. O’Keefe, D. Fiander, W. Coffey, R. Stead, D. Maddock-Parsons, P. Higdon, T. Paddle, B. Noseworthy and S. Kelland

Presenters – E. Dawe and D. Mullowney

## **Overview of Divisions 2HJ3KLNOP4R – E. Dawe**

### **Abstract**

Resource status was evaluated throughout NAFO (Northwest Atlantic Fisheries Organization) Divisions 2HJ3KLNOP4R based on trends in biomass, recruitment and mortality. Multiple indices of these metrics were derived from a suite of data sources that include dockside-monitored landings, fisher logbooks, at-sea observer monitoring, pre-and post-season trawl surveys, broad-scale post-season trap surveys, localized inshore trap surveys, a vessel monitoring system (VMS), and biological sampling data from multiple sources. The resource was assessed separately for offshore and inshore areas of each NAFO division, where appropriate (Div. 3KLP4R). Data availability varied among divisions and between inshore and offshore areas within divisions. The 1995-2009 fall post-season multi-species surveys in Div. 2J3KLNO indicate that the exploitable biomass was highest during 1996-1998. The more limited time series (1999-2008) from spring multi-species surveys in Div. 3LNOP also indicated a decline in exploitable biomass in the early years of the surveys. The spring and fall surveys both indicate that the exploitable biomass declined from the late 1990’s to 2003-2004, but has since increased. Recruitment has recently increased overall due to recovery in the south. Longer-term recruitment prospects are uncertain, but the spring and fall surveys indicate that there has been a decline in abundance indices of smallest males (<60 mm CW) in recent years that may indicate reduced biomass in the long-term. Trends in indices are described in detail for each division and conclusions are presented with respect to the anticipated effects of short term changes in removal levels on fishery induced mortality.

### **Discussion**

It was noted that in the presentation of data from the collaborative post-season (CPS) trap survey, there had been a switch from use of stations that were “common” to all years to a group of “core” stations which had been consistently sampled throughout the time series, especially in recent years. The number of common stations was declining as certain ones were not occupied for some reason. Core stations will remain the same over time, even if some are missed in a given year.

A sharp contrast was seen between high catches of very small crab in size frequencies from the trawl survey during 2000-03 and low catches thereafter. However, no reliable relationship has been established between abundance at these smallest sizes and subsequent commercial abundance. Any interpretation of long-term recruitment based on these small sizes must be cautious.

As well, the incidence of terminally molted undersize crab was seen to have increased in the last three years. Size at which terminal molt is reached is related to temperature and there has been some cooling in recent years that might be involved in this. In some areas this appears to have weakened recruitment that was evident a year ago.

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## **Division 2H – D. MULLOWNEY**

### **Discussion**

90 t of the 100 t quota established in 2008 was taken in 2009. Logbook data for 2009 are still preliminary and the series is confounded by major year to year shifts in distribution of effort. The VMS data are complete but also affected by these shifts. However, both trend downward, consistent with the decreased exploitable biomass seen in the trawl survey from 2006 to 2008.

There was no trawl survey in 2009. Catch rates were low in the trap survey carried out in the area in 2009 and the catch was dominated by commercial size, mostly old-shell crab. There is very little sign of any recruitment. This is consistent with catches in the 2008 trawl survey.

## **Division 2J – E. DAWE**

### **Discussion**

The overall 2J assessment is complicated by two distinct fishing areas, Cartwright Channel to the north and Hawke Channel to the south. Also, the CPS trap survey has been done only in the south. Hawke Channel appears to have declined more than Cartwright.

The distribution of effort during the 2009 fishery was affected by ice. Some fishers who normally fish Cartwright Channel couldn't fish there early in the season and shifted south into Hawke Channel. Even there, areas normally fished couldn't be accessed early. Some fishers who usually fish Hawke Channel shifted farther south to the boundary with 3K. Vessels also moved around and obtained poor catches in areas normally not fish. This would have affected fishery performance in 2009.

The VMS catch rates for the large vessels didn't drop as much from 2008 to 2009 as the logbook CPUE series. This is because the smaller vessels which don't have VMS were later getting out and fished in shallower areas closer to shore in 2009 because of the ice where longer soaks were required to catch anything.

A little over half of the 2009 landings are covered by logbook data that were available at the time of this assessment – around 80% is the norm. However, all of the weeks of the fishing season are covered. The pattern of CPUE variation over the 2009 season would have been affected by the unusual pattern of effort distribution. Catch rates were good at the start but effort was highly concentrated in one area in the south. There was dirty water with poor catches later in the season, especially farther north.

Fishers also reported that in certain areas, commercial crab catches were still very good at the end of the 2008 season, however, when they did get to these same areas later in the 2009 season, catches were very poor and they believe the crab had moved. Crab seemed to be spread around more and not concentrated in the deeper holes during the 2009 season.

Although the sharp decline in CPUE in 2009 may be partly due to unusual fishing patterns, it is consistent with the exploitable biomass declines seen in the fall trap and trawl survey indices. Despite all the factors confounding the 2009 CPUE, the decline in exploitable biomass was evident to fishers and they saw no sign of new recruitment for 2010. It looks like



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2010 will be an early season as far as ice is concerned, but there are concerns throughout the fleet with the decline that is apparent. Fishers feel that the decline in CPUE is more reflective of the southern portion of the Division. Cartwright Channel in the north seems to be holding up better than Hawke Channel in the south.

In the recent years of the 7-year lagged correlation between bottom temperature and crab fishery performance there has been cooling within an overall warming period – this has weakened the relationship. The CPUE series may be a poor indicator of biomass as well. A 35-year minimum is suggested for this kind of time-series analysis, however, the trawl survey biomass will be substituted for CPUE to see if that improves the relationship. That series, though, is only 15-years long compared to 25 years for the CPUE index.

Concern was raised about drawing conclusions on changes in exploitable biomass based on trends in point estimates for survey indices without consideration of the confidence intervals. It was argued, however, that overall conclusions represent the best interpretation of changes in biomass based on all available evidence, including recent fishery performance. Confidence intervals are provided in tables and the SAR will include a description of the indices. The conclusion for 2J is that exploitable biomass has declined and there's no sign of improvement over the short term. Recruitment for 2010 is low relative to a pulse that showed up in the trawl pre-recruit index in 2004 which showed up in the fishery in subsequent years, but that index has since been low and there has been no signal of a change. Even fisher participants from 2J support this overall conclusion.

### **Division 3K (Offshore) – E. Dawe**

#### **Discussion**

As in 2J, the start of fishing in 3K, especially in the offshore, was delayed by ice. This led to a major problem with high incidence of soft-shell crab. Soft-shell protocols were applied and as a result, 59 grids were closed to fishing. However, these closures are highly controversial and commanded considerable discussion at this RAP. When reviewed it was seen that only 3 grids would have been closed had protocols been properly implemented as they had been in other areas. Industry believes that the process applied in 3K during the 2009 season was seriously flawed.

The main bone of contention with grid closures was an inadequate level of sampling by observers for individual grids. However, although sample sizes may have been small for individual grids, when all the observer data were pooled, it was a very large sample which indicated the problem was big and widespread. If Resource Management had waited to act until each grid received additional sampling, there could have been a huge impact on soft-shell crab. Steps were taken early in an attempt to avoid excessive wastage of the resource. Nevertheless, it was clear that resource wastage in 3K during the 2009 season was excessive. Reduced exploitable biomass exacerbated the soft-shell problem. Because of all the closures, effort was shifted from prime to marginal fishing grounds, including into deeper water where soft-shell incidence was high. The end result was that a very substantial increase in effort was required to take the TAC. The 2009 experience showed that when there is a soft-shell problem it is generally widespread, and in 3K there is nowhere the fishery can go to avoid it. From the point of view of protecting soft-shell crab and avoiding resource wastage, the soft-shell protocols need to be re-evaluated.

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CPUE dropped sharply in 2009. The foregoing unusual circumstances during the season were contributing factors. However, the STRAP analysis of logbook data is designed to correct for re-distribution of fishing effort and address that kind of problem. That CPUE series dropped sharply as well. The end of season (2008) and start of season (2009) CPUEs were not much different – this is exceptional and suggests poor recruitment between those seasons. Clearly, reduced exploitable biomass was a major factor in the drop in CPUE in 2009.

As for 2J, additional data have weakened the lagged correlation between temperature and fishery performance. The relationship will be re-examined using the trawl survey exploitable biomass index for 3K along with a temperature index specific to 3K (possibly the CIL for the Bonavista or White Bay sections) rather than Station 27 (in 3L) data.

Fishers have noted some recovery of groundfish species, in particular cod and turbot, and wondered whether there were studies underway to evaluate their predation on crab. A summary was presented from current work on contents of cod and turbot stomachs collected in recent years. Crab and shrimp are among the prey of both species. There was very little crab found in cod stomachs collected in 2008, but slightly more in turbot. There was very little in turbot stomachs collected in 2007. Crab are found in cod and turbot stomachs mostly as intact whole skeletons. Only large cod prey on crab and small crab at that. Cruder data collected while sampling the catch on the multi-species RV survey, which identifies major prey items in stomachs of various groundfish, are also being examined.

It was noted that the high incidence of soft-shell crab during the 2009 season was not evident in the graph showing annual catch rates by shell condition from observer data. As in the past, the explanation suggested for this is because observers are required by DFO to discontinue biological sampling when high soft-shell incidence is encountered and focus on shell condition monitoring (soft-shell enumeration procedures). Observers present refuted this and explained that when soft-shell crab are encountered they don't switch away from biological sampling completely, but do less. Soft-shell counting procedures are initiated. Numbers from the biological sampling are extrapolated and transferred to the soft-shell protocols and these come in on situation reports. This continues until fishers start pulling strings, i.e. releasing all crab in traps at the surface without bringing any onboard. Only when counts exceed the 20% limit (15% in 3L) do soft-shell protocols kick in. The counts reported in sit reps can be used to get information on soft-shell crab. However, the low soft-shell incidence in their data for 2009 remains unexplained. This issue needs to be resolved by those working with the observer data.

Another ongoing source of confusion with observer data received much attention as well. This has to do with the graph showing annual catch rates of total discards and undersize crab. Total discards normally exceed undersize crab and the difference is interpreted as representing soft-shell crab. Confusion arises when undersize crab exceed total discards. The two catch rates are derived from different observer data sets. Total discards are from set and catch details whereas undersize is based on a small subset of the catch on which observers do detailed biological sampling. While the two catch rates won't necessarily agree very well, there is no obvious explanation for the undersize catch rate sometimes exceeding that for total discards. While observers are engaged in biological sampling, they try to keep track of total discards visually and these visual estimates are not as accurate as they otherwise would be. Total discards may sometimes be underestimated. Concern with this relates to interpretation when total discards exceed undersize but not when this is reversed. This component of the observer data used in the assessment also needs resolution.

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## **Division 3K (Inshore) – E. Dawe**

### **Discussion**

The fishery inshore in 3K was not as late starting as in the offshore area, but it increased slowly compared to other years. There was fishing in White Bay early on, because the ice stayed offshore. Recent trends in CPUE have been the same for inshore and offshore areas of 3K. CPUE for the inshore area of 3K is heavily weighted by the area that is an extension of the offshore area.

The CPS trap survey in 2009 shows a sharp decline in exploitable biomass for the 2010 fishery, and that is evident for most inshore CMAs.

Results from the fall RV trap survey conducted in White Bay and Notre Dame Bay show that BCD progresses from smaller to larger crab the following year. The progression also involves movement of crab from shallow to deep strata. This is more evident in White Bay where strata are narrow and shallow to deep movements involve shorter distances.

## **Divisions 3LNO (Offshore) – D. Mullaney**

### **Discussion**

This year, for the first time, the offshore area of 3L plus Divisions NO were assessed together. Fishers indicate that the CPUE series from logbooks prior to VMS implementation in 2004 is highly questionable because of widespread misreporting and should not be used. However, it was pointed out that the misreporting would not have applied to the CPUE series from observers, and it shows the same trends.

Trends in the trawl and trap survey exploitable biomass indices are different. Compared to the trawl index, changes in the trap index in recent years have been insignificant. This is explained by considerable difference in spatial coverage. The trawl survey covers the whole area including all shallow strata as well as the deep holes and deep strata that are not fished commercially. The trap survey covers only a small portion of the area fished.

In the STRAP analysis of the trap survey data, strata selected for aerial expansion are based on core stations. They don't include a large area of shallow strata on the northern part of the Bank or the deep ones that are covered by the trawl survey. Some of these strata are large and after aerial expansion contain large biomass. It's mainly in the deep strata that biomass has been increasing. It seems that the trap survey doesn't detect changes seen in the trawl survey until a year later. It was suggested that the two surveys be looked at on the basis of strata common to both.

In the shallow area SE of the Avalon, the trawl doesn't catch crab very well, but catch rates were high in the trap survey. This suggests problems with both surveys. However, some of the best catches in the trawl survey were in the shallow area near the Downing Basin, north of the area covered in the fall trap survey.

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## **Division 3L (Inshore) – D. Mullowney**

### **Discussion**

In 2009, effort increased and CPUE was lower. For inshore 3L overall, exploitable biomass has been declining. However, there are signs of good recruitment, which is consistent with 3L offshore, but with considerable variability between CMAs. This leads to concern about possible high mortality on the pre-recruits that should be flagged.

Differences between observer and raw logbook CPUEs are explained by spatial bias in observer coverage. Prior to 2007, catch rates from observer coverage were higher, but since 2007 have been nearly the same. If factors that could explain the difference between them remained consistent, the two series would track each other. Inconsistent observer coverage in inshore CMAs is the only explanation for these differences. There is bias associated with combining data for several CMAs to represent overall inshore areas. This bias is the reason that this year the assessment looked at data on a CMA basis.

A lengthy debate ensued focused on the observer program in general, especially coverage in inshore CMAs. Fishers expressed concern about the low level of coverage, its inconsistency and what appears to be a lack of experienced observers for deployment in inshore areas.

Observer deployment is quite a challenge in all inshore areas. There is a big problem associated with arranging vessels for deployment. DFO requires that a certain number of observers be available, but there is a monthly limit on the number of sea days available. This means there isn't enough work to keep all observers fully employed for the season and many don't stay with the program. The situation is worse for the inshore because observers lose pay when they are out for only part of a day. It's more likely to have inexperienced observers available for inshore deployments. Another reason for the reduction in inshore deployments in 2009 is an increased demand for observers offshore. If offshore fishers intend to fish two different CMAs on a trip, they are required to have an observer onboard. This resulted in fewer observers available for deployment in inshore areas.

The observer program is run by C&P Branch. From their perspective, coverage and deployment are problems in all areas and there are many factors involved with respect to quality and number of deployments. Observers are deployed on a rotational basis irrespective of experience. There has been a reduction in fees, so there is less funding to run the program. Trying to achieve uniform coverage between areas, fleet sectors, etc. is a balancing act. It's a difficult situation for those doing the deployments as well as for those trying to make it a career.

The observer program was established for C&P purposes. Science was added later but the program has a dual function with no stated higher priority one way or the other. Nevertheless, there is a strong perception that C&P issues take priority.

Fishers are concerned about inadequate funding to do the work required as well the inconsistent coverage. They would prefer to have a program that provides consistent coverage in all areas so that data collected by observers is more useful in the stock assessment process. They realized, however, that these issues would have to go forward to another level for any kind of resolution. It was suggested they consider highlighting their concerns with the observer program in the Industry Perspectives section of the SAR.

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## **Subdivision 3Ps (Offshore) – E. Dawe**

### Discussion

Fishery performance has continued to improve in offshore 3Ps. CPUE has been increasing steadily and is now close to the long-term average. Exploitable biomass has recently increased and recruitment prospects remain promising.

The trawl survey in 3Ps is done in spring and provides a less reliable index of exploitable biomass for the current year's fishery than the CPS trap survey. There are various indicators of coming recruitment. Old and new-shell commercial size crab in the trap survey represent immediate recruits for the next fishing season. The trawl survey pre-recruit index represents recruitment that is 2-3 years away, as do undersize crab in the trap survey. However, the pre-recruit index from the trawl survey, along with its size frequencies, provide a better index of recruitment. Compared to other areas, in 3Ps much more undersize crab are adults (terminally molted). This is always the case for this area and is associated with cold conditions which result in crab achieving terminal molt at smaller sizes. This results in some confusion and uncertainty with interpretation of the CPS trap survey recruitment index which is based on undersize crab but with no claw measurements to distinguish adults and adolescents. Small-mesh traps are deployed sparingly in this survey, mostly at shallower stations where a recruitment signal should be strongest and where relatively few small-mesh traps should detect broad recruitment. Samples from these small-mesh traps are kept for detailed measurements, including claw size. These samples should be examined for possible use as an additional recruitment index.

For this area, the lagged correlation between fishery CPUE and temperature has remained strong with the addition of recent data, in contrast to the weakening of the relationship for areas to the north. The index used here is the % of the bottom area of St. Pierre Bank with  $<0^{\circ}$  C water. The CIL used as an index for northern areas is derived from the oceanographic section off Bonavista. The CIL index is the area ( $\text{km}^2$ ) through the vertical section with temperature  $< 0^{\circ}\text{C}$ . Bottom temperature on the Banks is probably a better index, but there is no explanation for why the correlation has held up so well for 3Ps. However, it does indicate a strong environmental effect involved in crab recruitment.

## **Subdivision 3Ps (Inshore) – E. Dawe**

### Discussion

Fishery performance has continued to improve in the inshore area of 3Ps. CPUE has been increasing steadily and is now above the long-term average. Exploitable biomass has recently increased but appears to have peaked. Recruitment prospects remain promising.

The raw logbook CPUE increased in 2009 but the STRAP logbook CPUE was the same as in 2008. There was no obvious explanation for this but was likely due to some re-distribution of fishing effort or the resource itself with respect to the area fished. This will need more detailed spatial evaluation.

A drop in the observer CPUE in 2009 is related to a reduction in observer coverage in Placentia Bay and an increase in Fortune Bay where catch rates are lower. This shift could not be explained.

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Changes in exploitable biomass are interpreted from commercial-size crab in the CPS trap survey. The data set is edited to eliminate long soak times, etc. to standardize as far as possible. The survey is done in fall after the fishery and provides an indication of what will be available in the next fishing season.

Recruitment potential for the short term beyond 2010 is indicated by undersize in the trap survey. Undersize in fall 2009 should start to impact the fishery in 2011. Size progression among undersize crab is not obvious in size frequencies from small-mesh traps. When there is a high proportion of terminally-molted, undersize crab, modes in the size frequencies don't seem to shift towards the legal size. Nevertheless, these crab have to molt and grow before reaching terminal molt. It may be that growth in the terminal molt is low.

There is concern among Placentia Bay fishers that inclusion of Fortune Bay and Pass Islands in an overall summary for the 3Ps inshore area will negatively impact them. But, Placentia Bay drives this fishery. Those in Fortune Bay and Pass Islands are very small and the overview would be the same without those data.

#### **Division 4R (Offshore) – D. Mallowney**

##### Discussion

Landings and effort in offshore 4R have been low and CPUE has been below the long-term average in recent years. The TAC has not been achieved for seven consecutive years. In the past there was much difficulty with interpretation of the CPUE series because of major spatial shifts in the fishery. However, there has been much less shifting of effort in recent years (2007-09).

Exploitable biomass has been low relative to when the TACs were being achieved. Fishers know that crab abundance has been low compared to the past. The crab fishery overlaps with the turbot fishery, and fishers just make a few sets before going on to turbot fishing. Recruitment has been low and longer-term prospects are unknown.

Data from a multi-species summer trawl survey conducted in the Gulf by Quebec Region were available in this assessment. The survey caught very small numbers of crab. Most sets had zero catches of crab, there were only certain areas where any were caught. The survey started in 2004 when landings were much higher than later but it caught few crab then as well. It includes nothing from the earlier period to which the recent very low catches can be compared.

#### **Division 4R (Inshore) – D. Mallowney**

##### Discussion

Landings and effort have declined steadily in inshore 4R since 2004, to historical lows in 2009. CPUE has declined steadily since 2002 to its lowest level in 2009. There is variability between various CMAs and the fishery in Bonne Bay has been closed.

The CPS trap survey indicates that exploitable biomass has remained low since 2005, but recruitment should increase over the next 2-3 years. This expected increase in recruitment is based on the catch rate of undersize crab, which is driven by Bay St. George, but there is considerable spatial variability. The trawl survey also obtained high catches of small crab in

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two inshore strata, one of which extends into Bay St. George and the other into area 13. Increased pre-recruit abundance raises concern about possibly higher fishery-induced mortality on soft-shell, legal-size crab (immediate pre-recruits).

### **RESEARCH RECOMMENDATIONS FROM 2009 RAP**

1. Carried forward from 2008 RAP. Investigate the possibility of standardizing crab logbook data so that year-to-year comparisons of commercial CPUE as well as comparisons between fishery and survey indices can be made with greater confidence.
2. Carried forward from 2008 RAP. Continue efforts to determine how to compute C.I.'s for time series of mean values and estimated population indices.
3. Carried forward from 2008 RAP. Investigate bias introduced into time series of observer shell condition data by changes to sampling protocols associated with high soft-shell incidence.
4. Carried forward from 2008 RAP. Investigate the possibility of breaking down observer discard data by size and shell condition using observer at-sea sampling data.
5. Examine the utility of post-season trap survey data from small-meshed traps, including data on claw height, in inferring recruitment prospects.
6. Investigate the effects of spatial and seasonal variation in observer coverage, and account for these effects in developing observer-based indices.

### **PROGRESS ON RESEARCH RECOMMENDATIONS FROM 2009 RAP**

1. Spatial analysis (STRAP) was applied to both logbook and CPS trap survey data. No further standardization was attempted, nor is any planned in the near future.
2. This was not addressed. Recent concerns with reliability of fishery data and variable efficiency of survey gear call this recommendation into question. No further work is planned
3. It has been clarified that detailed sampling is not suspended by observers when monitoring for the soft-shell protocol is implemented, such that there is no longer concern for bias in shell condition data from the at-sea sampling.
4. This recommendation was not addressed and will be carried forward.
5. This recommendation was not addressed and will be carried forward.
6. Completed; observer data were screened and inadequate data rejected. Also

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observer-based indices for inshore areas have now been compared at the CMA level, to reduce bias in spatial coverage.

## **RESEARCH RECOMMENDATIONS FROM 2010 RAP**

### Scallops

1. Investigate a possible link with oceanography in the continued high biomass of sea stars on St. Pierre Bank after scallop biomass declined.
2. Investigate a possible link with oceanography in the lower meat yields (higher meat counts) of scallops on St. Pierre Bank.
3. Investigate catches in lined gear for an index of scallop recruitment on St. Pierre Bank.

### Whelks

1. Conduct sampling required to determine size and age at maturity in whelks on St. Pierre Bank.
2. Investigate possible implications of an increase in size limit from 63 mm to 70 mm for the whelk fishery on St. Pierre Bank in terms of immediate reduction in catch.

### Crab

1. Substitute the trawl biomass index for CPUE in crab abundance versus temperature correlations and consider use of other more appropriate bottom temperature indices.
2. Carried forward from 2009 RAP. Investigate the possibility of breaking down observer discard data by size and shell condition using observer at-sea sampling data. Investigators need a clearer understanding of how catch rates of discards and undersize crab are derived from their catch/set details and biological sampling, as well as an understanding of the comparability of discard estimates when biological sampling is being conducted.
3. Include a more comprehensive evaluation of possible predation effects
4. Re-evaluate (and document changes to) the stratum selection scheme, as well as changes from common to core stations and strata, used in STRAP analysis of logbook and CPS trap survey data.
5. Re-evaluate the utility of continuing to present the 3LNO CPUE series prior to implementation of VMS in 2004.
6. Reconsider (fix) year alignment in graphs presenting indices from the CPS trap and spring trawl surveys.



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7. Analyze data from the inshore 3Ps RV survey for presentation at the next RAP.
  8. Consider STRAP analysis for 4R CPS trap survey data.
  9. Carried forward from 2009 RAP. Examine the utility of post-season trap survey data from small-meshed traps, including data on claw height, in inferring recruitment prospects.
  10. That science review what the minimum requirements for observer data are, prioritize areas that need coverage, and communicate these needs more forcefully to C&P.
  11. Evaluate the utility of comparing between the post-season trap and trawl Survey indices based on selecting strata common to both surveys.

### **RECOMMENDED RESEARCH DOCUMENTS**

The Iceland Scallop in the Canada-France Transboundary Zone of St. Pierre Bank by D. E. Stansbury, E. Hynick and F. M. Cahill

An Assessment of Newfoundland and Labrador Snow Crab (*Chionoecetes opilio*) in 2009 by E. Dawe, D. Mullaney, D. Stansbury, E. Hynick, K. Skanes, P. Veitch, E. Colbourne, P. O'Keefe, D. Fiander, W. Coffey, R. Stead, D. Maddock-Parsons, P. Higdon, T. Paddle, B. Noseworthy and S. Kelland

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## **APPENDIX I: TERMS OF REFERENCE**

### **Terms of Reference**

#### **Regional Advisory Meeting Assessment of Snow Crab and Iceland Scallop February 24-26, 2010**

Holiday Inn, Portugal Cove Road  
St. John's, Newfoundland & Labrador

March 1-5, 2010<sup>1</sup>  
Northwest Atlantic Fisheries Centre  
80 East White Hills Road  
St. John's, Newfoundland & Labrador

**Chairperson: Becky Sjare**

#### **Background**

The status of Divisions 2HJ3KLNO, Subdivision 3Ps and Division 4R snow crab were assessed in 2009. The current assessment of these stocks is requested by Fisheries and Aquaculture Management to provide data that will be used in the 2010 Snow Crab Management Plan. The status of Iceland Scallop in the Canada-France trans-boundary Zone of the St. Pierre Bank was last assessed in 2006. The current assessment these stocks is requested by Fisheries and Aquaculture Management to provide current information on the status of the resource.

#### **Objectives**

Status of the following stocks will be assessed:

Snow Crab: Divisions 2HJ3KLNO, Subdivision 3Ps, and Division 4R  
Iceland Scallop: Subdivision 3Ps (St. Pierre Bank)

#### **Outputs**

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

#### **Participants**

DFO Science  
DFO Fisheries and Aquaculture Management  
Industry Representatives  
Provincial Department of Fisheries and Aquaculture  
Memorial University  
Aboriginal organizations  
Members of the public with knowledge of the fishery and/or snow crab and/or scallop biology

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Members of the public with knowledge of the fishery and/or scallop biology

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

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## APPENDIX II: AGENDA

### AGENDA

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

Salon A and B, Holiday Inn, Portugal Cove Road  
St. John's, Newfoundland & Labrador  
**February 24-26, 2009**

Northwest Atlantic Fisheries Centre, 80 East White Hills Road  
St. John's, Newfoundland & Labrador  
**March 1-5, 2009**

**Chair: Becky Sjare**

<b><u>Wednesday, February 24</u></b>		
0900	Preliminaries	
0930	Greetings from the Chair	Becky Sjare
0945	Scallops in the Canada-France transboundary area, St. Pierre Bank, NAFO Subdiv. 3Ps	Don Stansbury
1030	<b>BREAK</b>	
1045	Scallops cont'd and Science Advisory Report bullets	Don Stansbury
1140	Progress on determining length at Mat50 for whelk	Dave Taylor
1200	<b>LUNCH</b>	
1300	Oceanographic Overview	Eugene Colbourne
1400	Investigation of Factors Affecting Prevalence and Distribution of Bitter Crab Disease in Male Snow Crab along the Northeast Coast of Newfoundland	Darrell Mallowney
1430	Overview of the Snow Crab Resource in NAFO Divisions 2HJ3KLNOPs4R and Science Advisory Report bullets	Earl Dawe
1500	<b>BREAK</b>	
1520	Report on exploratory snow crab survey in Northern Labrador, NAFO Div. 2H and Science Advisory Report bullets	Juliana Coffey
1540	Division 2H and Science Advisory Report bullets	Darrell Mallowney

1610	Division 2J and Science Advisory Report bullets	Earl Dawe
1730	<b>ADJOURN</b>	

**Thursday, February 25**

0900	Division 3K	Earl Dawe
1010	<b>BREAK</b>	
1030	Division 3K cont'd	
1200	<b>LUNCH</b>	
1300	Division 3K cont'd and Science Advisory Report bullets	
1330	Divisions 3LNO	Darrell Mallowney
1500	<b>BREAK</b>	
1520	Divisions 3LNO cont'd	
1730	<b>ADJOURN</b>	

**Friday, February 26**

0900	Sub-Division 3Ps	Earl Dawe
1030	<b>BREAK</b>	
1050	Sub-Division 3Ps cont'd and Science Advisory Report bullets	
1230	<b>LUNCH</b>	
1330	Division 4R and Science Advisory Report bullets	Darrell Mallowney
1515	<b>BREAK</b>	
1530	Review of all and Science Advisory Report bullets	ALL
1600	Research Recommendations	ALL

**Mon –Fri March 1-5: Writing of the Science Advisory Report (SAR) at Northwest Atlantic Fisheries Centre, 80 East White Hills Road in EPS Boardroom.**

**NOTE:** Any time lost due to weather conditions will be made on the weekend of Feb 27-28, as required.

### APPENDIX III: LIST OF PARTICIPANTS

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## APPENDIX IV: LIST OF WORKING PAPERS PRESENTED

The Iceland Scallop in the Canada-France Transboundary Zone of St. Pierre Bank by D. E. Stansbury, E. Hynick and F. M. Cahill

Comments on the 2009 NL Whelk Fishery by D. Taylor, E. Hynick and D. Fiander

Investigation of factors affecting prevalence and distribution of Bitter Crab Disease in male snow crab along the northeast coast of Newfoundland by D. Mullaney and E. Dawe

Oceanographic Conditions in NAFO Divs. 2J3KLNO and 3Ps during 2009 by E. Colbourne, J. Craig, C. Fitzpatrick, D. Senciall, P. Stead and W. Bailey

Exploratory Snow Crab Survey, NAFO Division 2H, 2009 by J. Coffey, D. Mullaney, J. Snook, G. Brothers and E. Dawe

An Assessment of Newfoundland and Labrador Snow Crab (*Chionoecetes opilio*) in 2009 by E. Dawe, D. Mullaney, D. Stansbury, E. Hynick, K. Skanes, P. Veitch, E. Colbourne, P. O'Keefe, D. Fiander, W. Coffey, R. Stead, D. Maddock-Parsons, P. Higdon, T. Paddle, B. Noseworthy and S. Kelland