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Proceedings of the Newfoundland and Labrador Regional Advisory Process for 3Ps Cod, 2+3K American Plaice, and 3LNO and 3Ps Monkfish

Compte rendu de la réuinon du Processus consultatif régional de Terre-Neuve-et-Labrador sur les stocks de morue de 3Ps, de plie canadienne de 2+3K et de baudroie de 3LNO et 3Ps

20-24 October 2003
The Sunporch Meeting Room, Murray's Pond Fishing and Country Club
1464 Portugal Cove Road, Portugal Cove - St. Philips, Newfoundland

27-31 October 2003
E. B. Dunne Boardroom, Northwest Atlantic Fisheries Centre
St. John's, Newfoundland

W. R. Bowering, D. R. Osborne and E. D. Richards

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Fisheries and Oceans Canada
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SUMMARY

A meeting of the Newfoundland Regional Advisory Process (RAP) on Groundfish was held 20-24 October 2003 in Portugal Cove, Newfoundland and 27-31 October 2003 in the St. John's, Newfoundland. Full assessments of the stock status of 3Ps cod, 2+3K American plaice, and 3LNO and 3Ps monkfish were reviewed. These proceedings contain a summary of working papers and related discussions. Also included as appendices are the participants of the meeting, a listing of working papers and the remit. Additional information on the resources assessed is available in CSAS research documents and stock status reports.

SOMMAIRE

Dans le cadre du Processus consultatif régional (PCR) de Terre-Neuve, qui s'est réuni du 20 au 24 octobre 2003 à Portugal Cove et du 27 au 31 octobre 2003 à St. John's, on a passé en revue des évaluations détaillées de l'état du stock de morue de 3Ps, de plie canadienne de 2+3K et de baudroie de 3LNO et 3Ps. Le présent compte rendu contient un résumé des documents de travail et des discussions connexes et, en annexe, une liste des participants à la réunion, une liste des documents de travail et la demande de renvoi. D'autres renseignements sur les ressources évaluées sont présentés dans les documents de recherche et les rapport sur l'état des stocks du SCES.

INTRODUCTION

A meeting of the Newfoundland Regional Advisory Process (RAP) on Groundfish was held 20-24 October 2003 in the Sunporch Meeting Room, Murray's Pond Country Club, Portugal Cove, Newfoundland and 27-31 October 2003 in the E. B. Dunne Boardroom, Northwest Atlantic Fisheries Centre, St. John's, Newfoundland. Full assessments of the stock status of 3Ps cod, 2+3K American plaice, and 3LNO and 3Ps monkfish were reviewed. An overview of ocean climate conditions during 2003, in comparison to the historical record, was also presented.

Participation in the advisory process included both scientific and fisheries management staff from the Fisheries and Oceans Canada (DFO) – Newfoundland and Labrador Region, DFO – Quebec Region, Provincial Government representatives, Memorial University of Newfoundland, French Research Institute for Exploitation of the Sea (IFREMER), industry and the general public (Appendix I). A total of 14 Working Papers were presented and reviewed (Appendix II).

Summary points for those stocks assessed are as follows:

<u>Division 3Ps cod</u>:

- Stock status was evaluated from commercial landings (1977 until 31 March 2003) and log-book data in conjunction with abundance indices from Canadian (1972-2003) research vessel trawl surveys, industry trawl surveys (1997-2002), and sentinel fixed gear surveys (1995-2002). Exploitation rates were estimated from tagging experiments and sequential population analyses.

- During 2002 the age composition of the commercial catch changed markedly from the preceding year. Smaller cod (5 yr olds) dominated the catch, with the percentage of 5 yr old cod in 2002 (24%) approximately twice the 2001 value (13%). There was a corresponding decrease in the percentage of many older age classes.

- During 2002, mean exploitation estimates from tagging experiments declined slightly to 20% for cod tagged in Placentia Bay (compared to 30% in 2000 and 26% in 2001). Mean exploitation estimates during 2002 for cod tagged in Fortune Bay (10%) and Burgeo Bank - Hermitage Channel (5%) were almost identical to those of the two preceding years.

- Spawner biomass estimates for 1 January 2003 from five sequential population analysis formulations ranged from 82,000 t to 185,000 t.

- In all five formulations, spawner biomass was estimated to be higher in 2003 compared to 2002.

- In this assessment the size of the 1997-1999 year classes was estimated to be lower than determined during the 2002 assessment. Consequently the outlook about the short-term productivity of the stock is less optimistic.

- Three-year deterministic projections to 1 April 2006 were carried out for all 5 SPA formulations, for fixed annual TAC options ranging from 10,000 to 20,000 t for the 2004/2005 and 2005/2006 fishing seasons.

- At a TAC of 20,000 t four of five formulations indicate that spawner biomass would decline by 1 April 2006. At a TAC of 15,000 t or 10,000 t three of five formulations indicated that spawner biomass would decline.

- The current projections are consistent with those in the 2002 assessment in that most formulations showed an increase in spawner biomass between 2002 and 2005 although the magnitude of the increase was generally less in this assessment.

Subarea 2 + Division 3K American plaice:

- Stock biomass has remained very low since 1992 and has declined since the last assessment (2000). Stock biomass is currently estimated to be about 3% of the 1980-84 average.

- Reported by-catch averaged about 100 t per year from 2000 to 2002, compared to an average of 13 t per year from 1994-99.

- Median age at 50% maturity for females declined from about age 11 during the 1960s to age 8 in the 1990s.

- Survey data for 1978 to 2002 indicated that there have been no good year classes since the mid- 1980s.

- Estimates of total mortality indicate that for ages 5-10, average mortality over the last five years has been high (0.76).

- The stock continues to decline despite low levels of catch. There is extreme concern for this stock.

Divisions 3LNO and Subdivision 3Ps monkfish:

- There are deficiencies in the knowledge of monkfish in 3LNOPs limiting our ability to assess the species: information on size and age structure, growth rates, age of maturity, commercial catch size and ages are lacking, and there are uncertainties in reported landings.

- Survey biomass and abundance data show considerable fluctuation among years. Variable catchability or availability for this species makes it difficult to monitor.
- In 2003, average size was at a low in the time series while abundance was relatively high suggesting the possibility of good recent recruitment. Survey biomass has increased from mid-1990's to the present.
- Landings remained low until 2002-2003 when they increased by about 6 times to 2,795 t compared to those during the previous five years due mainly to an increase in effort driven by market conditions. This species is not under quota regulation.
- As a result of the increase in landings in 2002-2003, the index of exploitation (catch/RV biomass) has increased 4 fold compared to the previous 5 years. Fishing mortality may now exceed a sustainable level.
- Further development of the stock will have to be closely monitored given the expansion of the effort on this resource. Fishing effort now occurs over much of the area where monkfish are distributed.

WORKING PAPER SUMMARIES AND RELATED DISCUSSION

Working Paper 1: Physical Oceanographic Conditions in NAFO Division 3P during 2003 – Possible Influences on the Distribution and Abundance of Atlantic Cod (*Gadus morhua*) – E. B. Colbourne and E. F. Murphy

Abstract:

Time series of temperature anomalies from NAFO Division 3P (particularly on St. Pierre Bank) show anomalous cold periods in the mid-1970s and from the mid-1980s to late 1990s. These conditions were similar to those observed along the east coast of Newfoundland and Labrador, except the latter cold period lasted longer on St. Pierre Bank than it did on the eastern Newfoundland Shelf. During the most recent cold period, which started around 1985, temperatures were up to 1°C below average over all depths and up to 2°C below the warmer temperatures of the late 1970s and early 1980s in the surface layers. Temperatures in deeper water off the banks during all years show significant variations, but remained relatively warm with values in the 3°-6°C range, compared to much colder values (often <0°C) on St. Pierre Bank. Beginning around 1996 temperatures on St. Pierre Bank started to moderate, decreased again during the spring of 1997, but returned to normal values during 1998. During 1999 and 2000 temperatures continued to increase reaching the highest values since the late 1970s in the surface layers. During the spring of 2001 and 2002 however, temperatures cooled significantly over the previous two years to values observed during the mid-1990s and to values observed during the mid-1980s by the spring of 2003. The areal extent of <0°C bottom water increased significantly from the mid-1980s to the mid-1990s but decreased to very low values during 1998-2000. During 2001 however, it increased again, returning to values observed during the mid-1990s, decreasing slightly again during 2002 only to increase to >40% in 2003, the highest in about 13 years. The areal extent of bottom water with temperatures >1°C increased to pre-1985 values during 1999-2000 but during the last three years it has decreased by about 25%.

On St. Pierre Bank bottom water with temperatures <0°C essentially disappeared during the warm years of 1999 and 2000. It has since increased to between 20-30% during 2001 and 2002 and to over 90% in the spring of 2003. The area of near-bottom water on the banks with temperatures >1°C was about 50% of the total area during 1998, the first significant amount since 1984. This subsequently increased to about 70% during 1999 and to 85% during 2000, but decreased to low values during the past 3 years.

The analysis presented here show significant variations in the water mass characteristics particularly on St. Pierre Bank during the past several years. From the mid-1980s up to 1997, a cold near constant salinity water mass influenced most of the upper 100-m of the water column. A change to much warmer and saltier conditions occurred during 1998 and 1999 and to fresher but still warm conditions during 2000. During 2001 salinities increased to above normal values, while temperatures generally decreased to below normal values as cold water returned to the region.

Oceanographic observations during the spring of 2003 indicate a continuation of the decreasing trend in temperatures that began in 2001.

The dominant oceanographic signal potentially influencing cod habitat in this region is the volume of $<0^{o}$C water advected into the region from the eastern Newfoundland Shelf by the inshore branch of the Labrador Current. The extent and temperature of this water mass that eventually makes its way onto St. Pierre Bank is governed by advection rates, vertical mixing by storms during the winter and spring and surface heat flux. The most evident trend in the numbers of cod caught per set is the high number of zero catches in the cold ($<0^{o}$C) waters on St. Pierre Bank and regions to the east of St. Pierre Bank mainly from 1985 to 1998 and from 2001 to 2003. During 1999 and 2000 larger catches became more wide spread over St. Pierre Bank region as the cold ($<0^{o}$C) water disappeared from the area. In general, during all surveys most of the larger catches occurred in the warmer waters (2^{o}-6^{o}C) along the slopes and areas to the west of St. Pierre Bank. In addition, variations in the estimated abundance and biomass of cod in strata with water depths <92 m are significantly correlated with bottom temperatures for that depth range. However, there is no significant correlation between bottom temperatures and the abundance of cod for strata with water depths >100 m. Nevertheless it appears that cod tend to avoid the colder portions of the thermal habitat in this region and consequently change their spring distribution from one year to the next, depending on ocean climate conditions.

Discussion: (Rapporteur - E. D. Richards)

- Clarification was requested regarding the bottom and surface waters temperatures.
- The 2003 values are the coldest volume of water since late 1980s and early 1990s. The area that is most influential is less than 100 m. Are the data sensitive enough to detect changes in distribution? No correlation has been seen in the area of deeper waters.
- One noteworthy point is the recent surveys occurring in February rather than in late April? According to the author, there is no dramatic change over this time period despite the change in survey time. The oceanographic change occurs in the fall.
- There is no correlation between abundance or biomass in the deep/cold waters.
- Is temperature affecting the catch index? No correlation was found over the whole region; however, in the shallower region there appears to be a correlation. Two distinct regimes are being observed.
- The variability of the RV-index in both places? Is it a lack of correlation or lack of predictability?
- In the late 1980s fish were scarce and this is only a snap shot of a few areas. There are other Banks that should be considered.

Working Paper 2: An Assessment of the Cod (*Gadus morhua*) Stock in NAFO Subdivision 3Ps in October 2003 - J. Brattey, N. G. Cadigan, B. P. Healey, G. R. Lilly, E.F. Murphy, P.A. Shelton, D. E. Stansbury, and J. C. Mahe

Abstract:

The main input tables and figures from the assessment conducted last year were updated with data from the 2002/03 fishery ending in March 2003 and the survey indices and tables of biological information were updated with results from the April 2003 survey. Topics covered included the catch-at-age, sentinel survey, science logbook data, GEAC survey results, RV survey results with the latter covering abundance biomass and distribution, age composition, size-at-age, condition, and maturity. The most notable differences were a switch in catch at age to smaller fish in the 2002/03 fishery and much higher proportions of mature female cod at young ages in the survey results. The 1997 and 1998 year classes were well represented in the GEAC and DFO RV survey catches, but much less so in the sentinel index.

Discussion: (Rapporteur – E. D. Richards)

- According to a fish harvester, this year the companies lowered their prices in about mid-July and prices were supposed to increase in September month. This may explain why the increase in catch is observed during the month of September.
- In the offshore, larger mesh can be used provided you are directing for another species. Figure 8 takes into account only commercial catch, not sentinel. Weight-at-age is used within the assessment, however, one needs to know what the numbers represent. There is a lot of variability within the data.
- There are no dramatic changes in the raw sentinel data for 2002 and therefore the same should hold for the standardized data as well. This presentation will be available.
- Catch rates are better for line trawl than gill net.

Landings by gear sector, month, unit area.

- It took fishers a long time to catch crab and that is another reason for the increase in the Fall catch. i.e. catch driven by the industry. Lobster, crab, and other experimental fisheries shouldn't be misinterpreted for a lack of fish. It may not be directed for in the same way that it was in the past.
- The effect of weather on small boats may have likewise influenced the catch.
- Landings in Sept. of 2003. Table 3a. Inshore gill net. So much fish taken as up to the last year. Does this mean that the fishery has ended? What is happening following the month of September? Much of the gill net has been caught by the end of September. Was there a concentration of fish somewhere and everyone went at it? Yet, it happened in Fortune Bay and Placentia Bay. It may be relevant when looking at logbook indices. There is a change in the fishing pattern and not in density of fish.

Catch-at-age

- Page 28 – 1997 year class is influencing the catch (figure 6). In figure 7 all the high values are offshore mobile gear; however, the low values are gill net. In terms of age: age 6 is dominating – this corresponds to last year.
- The 14-year-olds are tracking well. Almost all the catch from the large vessels come from the 3Ps(h) area.
- The sampling: the adequacy of the sampling of the gear. There is no sampling from the Nova Scotia catch. There is a problem with the long-line sampling in that it is very inadequate in the offshore areas. This was 500 t in 2000. What is the best adjustment we can make? It is about 10% of the catch. Catch from Nova Scotia is trying to be obtained. It was recommended that catch from 3Ps landed in Nova Scotia should be sought. It was remarked that this may present a funding problem.
- Table 4a. The French catch is not included and should be incorporated into this figure. These should be showed differently.

Weights-at-age

- Are there any theories of why we are seeing such a dramatic difference in weights at age? Temporal, where the fish are being caught, selectivity of the gear itself – may all be plausible reasons. It remains that these differences exist, however what causes them needs to be investigated.
- What is actually measured is length of the fish, not the weights. It's a length frequency, not a weight frequency. Weight is derived from the length. Part of the variability is seasonal variability; however, everything is averaged.

Logbooks <35'

- A fish harvester made the point that in his opinion discarding is not a factor. Fishers have learned to fish in order to limit discarding and he felt that for the most part this is being done.

Research Vessel Survey

- TAC same as last year.
- Estimation of commercial weight at age show very strong seasonal and gear effects.
- DFO survey index down slightly (split index up in Burgeo, down in eastern 3Ps).

Working Paper 3: Sentinel Surveys 1995-2003: Catch per Unit Effort in NAFO Subdivision 3Ps - D. Maddock Parsons and R. Stead

Abstract:

Sentinel enterprises continued to collect catch rate and biological information on inshore 3Ps cod resources in 2003. Gillnet catch rates (weekly average number of fish per net) in 2003 remained low compared to 1996-1998 catch rates. Catch rates in small mesh gillnet remained low. Linetrawl catch rates (weekly average number of fish per 1000 hooks) were similar to 2002 values, and continued to increase from the series low in 2000. Length frequencies of cod caught in small mesh gillnet showed fewer fish at the two size modes (36-44 cm and 52-56 cm) that this gear catches in both 2002 and 2003. Linetrawl catches, however, showed an increase in fish at the 44-50 cm size range in 2002 and 2003.

Discussion: (Rapporteur – E. D. Richards)

- The data are very much similar in comparison to last year for all gear types.

Unstandardized catch rates

- Catch rate indices have been flat for the last couple of years. There is no spike in the five-year-olds.
- The question was posed if there is any feeling that the commercial fishery is affecting the sampling rates? The reply was "Yes", often the net can not be set in the control site due to other nets already being set in the area. This suggests that catch rates from year to year are not comparable. What percentage of the time would you have gear conflicts? A fish harvester commented that only in August would such conflicts occur. When the fishery opens competition for commercial activity makes it difficult to do what was done in the previous year. Since 2000 there has been a decrease in activity in the bottom of Placentia Bay. Commercial logs often show the same as sentinel. There is disagreement on whether this is a true problem. How much of a change in fishing effort has occurred at the head of Placentia Bay since 1997?
- The comparison between the line trawl and sentinel and the whole fishery, is really no different. There has been no change in the sentinel. Are the line trawls being fished on different sites when there is a commercial fishery?

Working Paper 4: Updated Estimates of Exploitation from Tagging of Atlantic Cod (*Gadus morhua*) in NAFO Subdivision 3Ps during 1997-2003 – J. Brattey and B. Healey

Abstract:

This document updates the results of a multi-year tagging study of Atlantic cod (*Gadus morhua*), initiated in NAFO Subdiv. 3Ps in spring 1997, with about 8,000 additional cod tagged and released during April-June 2003. Since inception, a total of over 60,000 cod have been tagged with single, double, or high-reward t-bar anchor tags and released at various inshore and offshore sites off southern Newfoundland (3Ps) and 9,993 (16.5%) have been reported as recaptured to 30 September 2003. Estimates of exploitation for cod tagged in each region were computed using methods similar to those reported in our previous documents, but with some modifications. Among cod tagged in Placentia Bay mean annual estimates of exploitation have declined from 33% in 1999 to 20% in 2002; however, some individual estimates remain quite high with six of 14 estimates exceeding 20% in 2002. Mean annual estimates for cod tagged in Fortune Bay have been fairly stable at 10% to 11%; however, cod tagged at Poole's Cove are being much more heavily exploited than those off Pass Island in the outer reaches of Fortune Bay. Mean annual estimates for cod tagged in offshore areas remain consistently low (4% to 9% among cod tagged in 3Psd; 1-3% among those tagged in 3Psh). Some of the cod tagged in 3Psd (Burgeo Bank) are exploited in the neighbouring 3Pn4RS stock area, suggesting that stock mixing may extend to April in some years. As reported in previous analyses the exploitation estimates for 3Psh are extremely low given annual reported offshore landings ranging from 4,000 - 12,000 t during 1998-2002. Possible reasons include limited offshore tagging coverage, restricted distribution of offshore fishing effort, and low survival of cod offshore for tagging in deep (> 200m) water. In particular, there are substantial landings from areas on St. Pierre Bank (3Pse, 3Psf) that have generated few tag returns, suggesting that there are offshore stock components that have not been tagged. More extensive tagging coverage of the St. Pierre Bank area, particularly during fall, could improve the reliability of the exploitation estimates for the offshore regions.

Discussion: (Rapporteur – E. D. Richards)

- There are no major differences in tagging patterns from previous years. This may be further covered and expanded on in the mixing discussion.
- Are the fish in Fortune Bay a Bay Stock? Most cod tagged in Fortune Bay are captured in Fortune Bay. Very few offshore fish tagged in Fortune Bay are caught offshore.

Power Point Presentation: Tagging estimates of stock size and exploitation rates for 3Ps cod *- Noel Cadigan*

Discussion: (Rapporteur – E. D. Richards)

- What time of the year were the fish tagged? Fish in the offshore were tagged in April. Placentia Bay fish were tagged in April/May and October and November. The tagging on the Burgeo Bank occurs mostly April.
- There is not much Placentia Bay fish that moves in from the offshore.
- Author prefaced his work by noted that all of these analysis are completely tagging based.

Working Paper 5: Cod Catch Results 2002: Year Six of the NAFO Subdivision 3Ps Fall GEAC Surveys – J. McClintock

Abstract:

Cod catch results from the 2002 GEAC fall 3Ps survey were presented. This is the sixth year in the 1997-2002 survey time-series. Key observations include: the 2002 survey indicates a total abundance estimate for 37.9 million cod which is down by 14% from the 2001 estimate of 44 million but is still consistent with the 2000 estimate of 37.7 million. The total biomass estimate for 2002 is 92 ktonnes which is up 11% from the 2001 estimate of 82.7 ktonnes but is still less than half the 187 ktonnes estimate of 2000. The larger 2000 biomass estimate is due in large part to increased numbers of larger cod, age 6 years and older, and in particular age 10 and 11, caught in 2000 that were not present in the 2001 or 2002 surveys. Nevertheless, the appearance of large numbers of smaller fish aged 3 and 4 in 2001 continued in 2002 with 80% of the estimated total abundance being attributable to age 4 and 5 year old cod. While most of the cod caught in 2001 were located in the shallower depths of the St. Pierre Bank, the greatest numbers of cod in the 2002 survey were located in the deeper mouth and entrance of Halibut Channel where most of the large catches of the earlier survey years were located.

Discussion: (Rapporteur – E. D. Richards)

- The total abundance numbers/trends (table 2b) are different then what the RV surveys use. Has the size of the survey area changed over time? Don't think so – the deeper 700 series strata were not fished in the first year 1997 but otherwise the coverage has generally been consistent. There have been a number of the deeper stratum sampled. For index purposes what is needed is a set of strata that have been continuously fished. The area surveyed was much less in 1997. Alternatively, one can remove the deeper strata. One can undertake to review these sorts of summary data presented and determine which statistics might best lend themselves to comparison with the ongoing RV work.
- For SPA calibrations, it is necessary to know how the missing strata are treated. They are eliminated. Index strata need to be identified – i.e. strata occupied every year.
- Why did GEAC move into deep water strata? Was it multi-species surveys? Perhaps? Author was uncertain.
- These are the essentially the same strata that have been fished since start of surveys in 1997. American Plaice and Witch Flounder are also sampled in the surveys (at least since 1998)
- Suggestion: ACON plots completed by age may be useful. Author indicated that this had been done before and could be done in future if people think of use.

Working Paper 6: Seasonal Variation in Abundance and Stock Composition of Atlantic Cod (*Gadus morhua*) in Placentia Bay, Newfoundland in Relation to Fisheries - L. Mello and G. Rose

Abstract:

Atlantic cod (*Gadus morhua*) in Placentia Bay, Newfoundland, experience marked variations in abundance, age and size composition, and other biological traits over the annual cycle, based on biological, acoustic and commercial fishery data. The observed variability was related to different movement patterns and intermix of resident and non-resident groups of cod. Springtime abundance in 1999 varied between 3.2 and 11.2 million fish, mostly spawning and older cod (ages 7-10), and increased to 18.5 million fish in summer, comprised mostly of smaller and younger cod (ages 4-6). By early fall abundance decreased by up to 69% as summer migrants left the bay. In late fall, stock abundance increased by one quarter in relation to early fall, as larger cod rejoined smaller resident cod within the bay. In winter, cod may be found at various locations in the inner bay and protected embayments in dense aggregations. Biological traits such as growth rate, reproductive and physiological condition were useful indicators of putative stock components (i.e., resident and non-resident cod). Commercial landings mirrored survey distributions and suggested differentially high harvest rates (33%) in November 1999 for resident cod.

Discussion: (Rapporteur – E. D. Richards)

- Estimates are for the whole of Placentia Bay – not just a portion. In previous years only a portion of Placentia Bay was surveyed.
- Age/size composition, abundance, and spatial distribution of cod varied seasonally in Placentia Bay.
- The impact of the fishery on the different stock components is presently unknown.
- Stock assessment should incorporate seasonal variability in population parameters.
- How confident are you in the results of your study? The tagging data show that there is no intermixing between inshore and offshore components which lends support to this study. It is a stock complex issue. It's been clear that there is some resident component of concern. A lot of the exploitation in Placentia Bay is on the resident component, in comparison to fish going in and out, and that is the concern. It is suspected that by November month the majority of the fish in the Bay are resident.
- This study incorporates the whole bay, not just a portion – including the Burin Peninsula.
- Catch rates are done on weekly landings. Therefore it is a landings not a catch rate. The data that was used for the catches is just the landings from one client. This represents 49% of the landings for Placentia Bay. This is a limitation that should not be. It is possible to get all landings for Placentia

Bay? The author agreed but noted it represented fishermen from most areas of the bay.

- If there was no one fishing on eastern part in July, in comparison to the majority of the fishing occurring on the western side in July. The author noted that the data showed that most fishing in July was on the Eastern side of the outer bay and in the inner bay.
- In the Materials and Methods section, regarding the random design, was it necessary to use the Kringing approach? The author believed that geostatistics + Kriging was a good approach (as indicated by << CVs), because cod in the bay is found typically aggregated and hence would violate the assumptions regarding inferential methods based on random distribution theory, in my opinion.
- The final conclusion, from a conservation point of view is that the stock structure complex is justifiable when we have this information taken into account. What is it that you are suggesting that we do with this tagging information? The two studies support one another with regards to the final conclusions. A Management Objective is required. Effort has to be proportionally applied to all stock components depending on the size of the stock components. Spatial and timing restrictions are already in place. Despite all these measures that have been implemented, the exploitation rates are still not reducing the mortality in this area. It indicates that the stock is not going up in Placentia Bay. It's flat.
- If all of these management measures that are in place are having a positive effect then that should be mentioned in the stock status report.
- Generally, closing an area and the resulting shifting of exploitation to other areas is not that effective and does not necessarily achieve the objective. If you assume different components, this doesn’t apply.

Working Paper 7: Head of Placentia Bay Cod Spawning, Egg Potential and Recruitment – G. Rose

Abstract:

Acoustic surveys for spawning cod have been conducted in April in the head of Placentia Bay from 1996 to 2003, centred on the area known as the Bar Haven grounds, which encompass the western part of the bay, particularly around the Bar Haven, Woody and Sound Islands. These data are used to compute an index of potential egg production. This index is then compared to recruitment indices of cod both back to the head of Placentia Bay (measured during this work) and to the 3Ps stock . Densities were calculated for each 10 cm length increment (e.g., 10-19 cm, 20-29, 30-39…) from catch proportions. Although absolute estimates are feasible, especially for the more recent years of the survey, the numbers of cod present on the spawning grounds at any one time or survey is not the total number that may spawn. Hence, the fish numbers are presented as April indices. Potential egg densities were calculated from mature female densities (total density/0.5 * proportion mature at each length interval) and the fecundity-length relationship in Pinhorn (1984) (Log10 (eggs) = 1.73 + Log10 (length)) for Placentia Bay. Year-class strength at Bar Haven was estimated from hand-lines. The proportion of the 1996-1999 year-classes caught each year from 1998 to 2003 (starting as 2 year olds) was ranked, and the mean rank for each year-class standardized (sum of ranks = 1).

The major contributing spawning year-classes at Bar Haven have been the 1990 from 1996-1999, the 1992 from 1997 to present (lesser in past 2 y), the 1997 from 2002-2003, and the 1998 in 2003. From 1996-2003, potential egg production peaked in 1997 and 1998 at Bar Haven, as a result of a combination of higher fish densities and larger fish than in the other years. For the year-classes 1996 to 1999, there is significant correlation between the egg potential and the resultant year-class strengths as estimated at Bar Haven during the present work, and for the full 3Ps region. If this relationship holds up, based on recent acoustic surveys and egg production estimates, the year 2000 will have lower recruitment with 2001 about the same as 1996. 2002 and 2003 should bring stronger year-classes lower than but approaching those of 1997 and 1998.

This is a work in progress, and the mechanisms of recruitment in this stock are under further investigation.

Discussion: (Rapporteur – E. D. Richards)

- Placentia Bay fish have a very high egg production/fecundity. Fecundity for egg potential is at age 5 and 6.
- Year class strength is a ranking model. Why? It was simple. This is just a preliminary look at the data. It might actually be wise to try some other things with the data. Would this be a potential additional index to add to the Healey

model? Maybe. The 1990-96 year class results in Healey's model are almost identical.

- The inner Bay biomass was 7000 t – Spring 1999. 15 000 t would be a high number.
- There is a group of fish that over winter in the inner portion of the Bay and in the spring the offshore portion come in after the capelin.
- Should we include this in the recruitment index? It's a work in progress – a different approach that should be mentioned in the report; however, unnecessary to put in the model. This index is determined by acoustic surveys.
- There may be an alternative to Pinhorn's equation.
- The information is not ready to put into an additional index in the model but possibly in the future.

Working Paper 8: Limit Reference Points 3Ps Cod – P. Shelton

Abstract:

The cod stock off southern Newfoundland (3Ps) is thought to be within safe biological limits and supports the only significant commercial fishery (>10,000 t) on cod in Atlantic Canada. Currently there are no precautionary approach spawner biomass limit reference points in place. This study provides example application of candidate limit reference points to population estimates derived from the 2002 assessment, extended back to 1959. The candidates include five approaches/variants applied to three severely depleted cod stocks in February 2003 which led to the closure of the directed fisheries on these stocks. In addition, two new approaches based on non-parametric estimates of the probability of poor recruitment for a range of spawner biomass values and an approach in use in ICES called segmented regression are applied. While it is possible to develop a number of approaches for deriving limit reference points, it is essential that both the biological and statistical properties of these approaches be thoroughly evaluated through a process which includes simulation testing.

Discussion: (Rapporteur – E. D. Richards)

- The determination of Reference Points was not included in the 2003 fall RAP Remit. The Zonal Assessment in February 2003 applied 5 approaches/variants to the estimated from formulation D in the 2002 assessment and found B_{lim} to be in the range 30,000 – 53,000 t SSB. Two new approaches/variants, segmented regression and the probability of poor recruitment from a nonparametric smoother, were added in the present analysis. The estimate from segmented regression was within the range of previous estimates whereas the estimated based on the probability of poor recruitment was 55,000 t SSB This presentation may be considered as "food for thought" and presented suggestions to be considered in terms of any future implementation of the Precautionary Approach on this stock.
- In terms of responsibilities it was suggested that Science is capable of developing objectively based limits in keeping with the notion of serious harm, and it was the role of Fisheries Management to develop appropriate harvest control rules to ensure that the probability of the stock falling below B_{lim} was kept very low. The precedent had been set earlier in 2003 with regard to 3 cod stocks, to close all directed fishing when the stock is below B_{lim}, and thus in the region where serious harm has been done.
- The issue was raised regarding the complication of having 5 model formulations for 3Ps cod. Clearly this complicates matters. Either the information needs to be resolved to a single model, or 5 B_{lims} need to be computed, one for each model formulation.
- It was noted that assessment stability is required if we are going to use reference points. Changes in model formulations require reference points to be recomputed.

- It was noted that there are no management objectives laid out for 3Ps cod, and thus a complete management framework is yet to be developed for this stock.

Working Paper 9: Mixing - J. Brattey

Abstract:

Reported catches of cod from the mixing area (unit areas 3Psa and 3Psd) from November to April inclusive were tabulated for the period 1997/98 to 2002/03 and found to decline with only 260 t reported in 2002/03. The decline can probably be attributed to management changes, particularly the seasonal closure of 3Psd and the switch to IQ's rather than a competitive fishery west of the Burin Peninsula. The age compositions of the catches from the following sources were also compared: DFO RV survey of western 3Ps, DFO RV survey of eastern 3Ps, GEAC survey, northern Gulf Needler survey, northern Gulf sentinel gillnet and sentinel linetrawl, northern Gulf commercial catch-at-age. The results showed good synchrony in year-class strength between surveys conducted within 3Ps in recent years, with the 1997 and 1998 year classes showing strongly in recent years; the exception was in 1998 when several year classes, including the 1993 year class, appeared strongly in the index for the western portion of 3Ps suggesting extensive mixing. Surveys in the northern Gulf stock area showed that the 1993 year class was strong whereas the 1997 and 1998 year classes were not. Results from cod tagging conducted around Burgeo Bank during April since 1998 also show some recaptures from the northern Gulf in most years but exploitation rates were low. Overall the results suggest that landings of the magnitude reported from the mixing area in the most recent year are unlikely to have a significant impact on the population dynamics of the northern Gulf cod stock. The issue of splitting the DFO survey into two portions may require careful consideration in light of these findings; recent survey results suggest the Burgeo area may be an important over-wintering area for 3Ps recruitment which may be down-weighted if a split survey index is used in SPA's.

Discussion: (Rapporteur – E. D. Richards)

- The management measures of closures in 3Psd and 3Psa and the switch to I.Q.s influenced/complicated the mixing issue.
- In the Research Document were the recaptures quantified? Yes, 30-60%.
- It is clear that the 1998-year was different - 1998-2000 were very warm years in 3Ps.
- The I.Q.s impact. There are a series of closures that are influencing the mixing area as well.
- The catch effort database was reviewed, but there was no current information in the logbooks that could be followed. Sentinel age composition in 3Psa was dominated by the 1989 year class. This was a weak year class in the Gulf, indicating that it is 3Ps fish.
- It was suggested that cluster analysis may be helpful.
- Information that exists concerning the mixing issue. How we treat our surveys here, has to also be done in the Gulf. Split or no spilt is an advisable approach. The split is probably not the most advisable. A couple of year classes that are dominate in one area. Fairly compelling evidence that

splitting the index is not an appropriate thing to do. We still have the problem that from time to time we are going to get a result that will not work with the model – i.e. an irregular year. An attempt to reconcile an abnormal year. An attempt to clean up our historical data. Have the additional indices also helps (e.g. GEAC). There are clearly some Gulf cod in the middle of April in this area and we can't loose sight of that. The strong year classes observed are not outside the 3Ps area.

Working Paper 10: An Assessment of American Plaice Stock in NAFO Subarea 2 and Division 3K - K. Dwyer, W. M. Brodie, and J. Morgan

Abstract:

The stock of American plaice in NAFO Subarea 2 plus Division 3K remains at a very low level. Catches have increased since 1999, due mainly to by-catch in the Greenland halibut fishery. The composition of the A. plaice by-catch in this fishery is composed mainly of sexually mature females. Research vessel surveys indicate that the stock size is currently about 3-5% of the values measured in the early 1980's. Stock size has remained at this low level for several years following the closure of the directed fishery. Changes in the distribution of the fish were observed in the mid- to late 1980's, and size and age at maturity declined through the mid 1990's but has stabilized since then. Since the stock did not recover when catch levels were very low (mid to late 1990s), commercial catches do not appear to be a major contributor to the high mortality estimated in this stock. This is supported by recent catch/biomass ratios of less than 1%. Further, with no strong year-classes present in the population, and relatively high mortality rates, the prospects for stock rebuilding continue to be extremely poor.

Discussion: (Rapporteur – E. D. Richards)

- Prospect for stock rebuilding is very poor.
- Bycatch from one location? The sampling is from the otter trawl for Greenland halibut.
- The time series goes back to 1978. This is a long time series and the assessment is just not going back to the current survey.
- The 3L portion of American plaice is also at low levels. There has not been extensive tagging, but what tagging we do have doesn't show much movement from north to south.
- 1500 m is the depth of the survey. Industry indicated that there is no A. plaice beyond 300 fathoms. Toward the end of April there is no A. plaice bycatch. There is a continuous distribution of plaice between 3LNO and 2 + 3K, according to Industry? There is no break in the distribution. In areas where the population is so low, one doesn't see the continuity so much.
- Very comprehensive assessment. The length at 50% maturity of the females. The last length is poorly estimated. It was asked that if the current perception is that the trend has turned around? It is possible. However, more than a couple of cohorts are required to decide if there is a change.
- The thoughts are that this stock will be listed at least as endangered by COSWIC. Will reducing the bycatch further impact the recovery? 1997, 1998, and 1999 catches were very low (less than 10 t per year) and the stock showed no chance of recovery. The bycatch has shifted into deeper water and is catching mature females and this is reason to be concerned.
- During the 2001-2002 fishing season ice conditions and weather had an impact on the catch rates. Specifically, it was late April prior to fishing.

- Year class strength – The stock recruit scatter plot shows that a few year classes are some what higher; however, it is difficult to say what this means. This is the only time series we have for this stock.
- What is the condition of the fish? Are they limited by food source? There is no diet data apart from in 3LNO. Their length at age has not gone down. Predation has also not been quantified.
- COSEWIC will be shortly putting out bids to assess this stock. The conclusion may be that it is headed for extinction. Should we be saying something in the SSR to this effect? Should an attempt be made to reduce bycatch further? What conclusions can be drawn, if any?
- Is this a separate stock? When things get very low in abundance it gives the perception that it is more spread out?
- What about bycatch in the shrimp fishery and Greenland Halibut fishery? The spawner biomass indicates that the shrimp fishery isn't having any effect. This was looked at in 2001 and 2002. It is not a major bycatch in comparison to some other fisheries. Were the numbers large given that for the 2-3 year-olds the weight would not be very much?
- The multi-species surveys have used the same gear since 1995. The exception is the very near shore area. Surveys are done in November and December. Concern was expressed regarding looking for A. plaice in a traditionally cod area. The RV survey would include both good and bad areas for the target species – over 200 sets.
- Where the fishery shows that there is no American plaice, the RV survey is also showing that there is no fish. Historically, there was a mixed fishery on this stock. There also was a directed fishery on this stock prior to the 1990s.
- Conclusions: Stock status similar to the 2000 SSR. Recruitment is poor and prospects for rebuilding are very poor. The status of this stock relative to species at risk.
- Are there any types of reference points available? See page 9 and figure 15 of the Working Paper. This would be an important point to flag in the Summary bullets of the SSR. Report on the extreme concern for this stock.
- Given the trend in the Zs and the declining RV: something to the effect that the stock is heading towards biological extinction may be warranted. Any increase in catch would certainly have a negative effect on the stock and its ability to rebuild.
- Industry perspectives – concern was expressed regarding the possible change in management areas in the future. There is quite a body of evidence that suggests that there is not much connection between 2 + 3K and the Grand Banks. The bycatch of American plaice drops off after April or early May (i.e. there is a seasonal component). Industry would formulate a paragraph to add to the SSR.

Working Paper 11: An Ecological Approach to the Stock – Recruitment of Divisions 2J3K American Plaice: Analytical Tools and Preliminary Results - M. Koen-Alonso and J. Morgan

Abstract:

Stock-recruitment (*S-R*) relationships have puzzled fisheries biologists for decades. Many models have been developed to analyze them, but very few explicitly consider both top-down (e.g. predation on the juveniles that will become recruits), and bottom-up (e.g. availability of food for those juveniles) effects on recruitment. Here we propose a new multispecies-based *S-R* model derived from the idea that the instantaneous mortality rate *Z* is composed of two factors, one endogenous which depends on condition (and consequently on food availability) and determines the susceptibility to mortality sources, and another exogenous which depends on the actual mortality risks such as diseases and predation. We used a simplified version of the proposed model to analyze the *S-R* relationship of Div. 2J3K American plaice. We explicitly considered cod and harp seal as predators, and we used an average length at age as a surrogate for condition of each cohort. Using likelihood ratio tests we found that condition, cod and "other sources of mortality" had significant effects on American plaice recruitment, but not harp seals. These results indicated that both top-down and bottom-up processes are affecting recruitment, but they also suggested that the bottom-up may be more important. Using the corrected Akaike's information criterion (AIC_c) we compared the new multispecies-based model with the Beverton-Holt and Ricker models. The new model had the highest rank, but Beverton-Holt was very close. Further examination of the temporal pattern in recruitment, not considered by the AIC_c evaluation, indicated that unlike the other two, the new multispecies-based model was able to capture the pattern observed in the data but also showed some temporal shifts between the model predictions and the observed recruitments. Overall, the results obtained with the new model suggest that may be more information than noise in the typically scattered *S-R* relationships.

Discussion: (Rapporteur – E. D. Richards)

- This is clearly a work in progress. Two main conclusions: 1) there is a clear stock recruit relationship and 2) condition is an important factor. In other words, predation and condition affect recruitment.
- Referring to stock recruit models as simply mortality models is not clear and may cause confusion. It was recommended that the description of the derivation of the model be altered to eliminate this.
- Environmental factors (other than through their possible effects on condition) are not included in this model. The environment may have a role to play in the recruitment of this and other stocks.
- Cannibalism is not included in this model as there is not a factor for adult plaice population size. There are no diet data from this area but studies from other areas would indicate that juvenile plaice do not form a substantial part of the diet of adults.

Working Paper 12: Catch Rates for Vessels >35' - E. Murphy

Abstract:

Logbooks data from the greater than 35 foot vessel class were examined to determine if catch rate indices for various gears could be developed. Data was available for the following gears and vessel class: (1) gillnets >35- 45 ft, >45-65 ft, and >65 ft; (2) longline >35 to 65; and (3) ottertrawl > 65 ft. Median catch rates derived for gillnets were variable but showed an overall declining trend. In the Western portion of the stock area, the number of observations for gillnets both inshore and offshore for all vessel classes observed were small reflecting the fact that it is not the dominate gear. In the Eastern portion of the area, there were a quite adequate numbers of observations, especially if vessel classes were pooled. In the Eastern portion, more so than in the Western portion, there is potential for an index of gillnet catch rate both inshore and offshore from the > 35 ft vessel sector. Data to compile median catch rates for longlines for vessel 35-65 ft were available for the inshore and to a lesser extent for the western portion of St. Pierre Bank. Catch rates in the inshore varied with area. They were declining in the Burgeo Bank area, increasing in areas encompassing Fortune Bay and somewhat steady in Placentia Bay. In the offshore, catch rates have declined in the western portion of St. Pierre Bank. Median catch rates are presented for otter trawler greater than 65. However the amount of data are limited and catch rates observed are not realistic. There may be a problem in that industry survey data has been erroneously added to the catch and effort data base for trawlers. In conclusion, management issues such as timing of fishery because of closures in various areas, trip limits and market conditions and pricing policy may play a large role in catch rates by this and other sectors. The post moratorium time series for these data series will be six years when the 2003-2004 fishery data are included. These data will be further investigated to see if they can be modeled to provide catch rate indices especially for the offshore.

Discussion: (Rapporteur – E. D. Richards)

- Median otter trawl catch rates, perhaps search sets.
- What is the quality of the data? It looks good. The amount of gear for some of the gill nets may be problematic. Trip limits and quota limits are strictly regulated.
- The Management Plan has also changed over this time series.
- Given the problems, should this data be modeled besides plotting to get a signal out of the data? No, if the data are too variable.
- Some potential may be available for less than 45'.
- A lot of these observations do not have a lot of sets.
- Industry commented that regarding the Management Plan changes, they applied equally to the under and over 35' sector.
- This has the potential for an index; however, it has to be explored more fully.

Working Paper 13: The Status of Monkfish (*Lophius americanus* Valenciennes 1837 Lophidae) on the Grand Banks, NAFO Divisions 3L, 3N, 3O, and Subdivision 3Ps - D. W. Kulka and C. M. Miri

Abstract:

Monkfish is at the northern fringe of its distribution on the southwest slope of the Grand Banks, with the exception of occasional records to the north on the Labrador Shelf in deeper, warmer trenches and on the slope edge. It is associated with the warmest available bottom waters. The general location of monkfish have remained constant over time (records back to the 1950s but biomass at depth was observed to change over time. A shift to deeper waters after the mid-1980s followed by a return to shallower depths in recent years may be related to a cooling trend during the mid-1980s. Nearly all of the biomass from Spring surveys occurred in NAFO Div. 3O and Subdiv. 3Ps; with two-thirds in Div. 3O. Biomass and abundance (less pronounced than biomass) indices fluctuated over time, peaking in 1977, declining to a low in 1979, peaking again in 1988. Biomass then fluctuated downward reaching a low in 1992-93. Since then, the index has increased, fluctuated widely. 2003 represents a year of peak abundance, almost double that of the previous year. The abrupt changes from year to year likely do not reflect dramatic fluctuations in the population. Rather, these changes suggest that there may be a catchability issue. However, there is a distinct pattern of increases followed by declines over time, the biomass having peaked 3 times in the last 33 years. Mean weight of monkfish also peaked in the mid-1970s and late 1980s, in conjunction with the peaks in biomass. However, unlike the biomass, it has declined since 1996. A Canadian experimental trawl fishery for monkfish contributed to an increase in monkfish landed in 1991. A directed gillnet fishery began in 1993. In 1995-1997, a 200 metric tonne quota was instituted, but was removed in 1998. Landings increased from 1995 to 1998 then declined. In 1998-2000, bycatch restrictions as per licence conditions was the primary limitation on effort in the fishery and catch of monkfish. However, an expansion into the South Korean market and associated high price for the product has led to sharply increased (record) effort. Participant in the fishery increased from 9 in 2001 to about 80 in 2003. Total catches increased from 168 t in 2000 to 2,994 t in 2003. Correspondingly, relative F (index of exploitation) has increased by 5 times in the past two years after declining since 1998. Given the limited knowledge of most aspects of monkfish biology and relevant fisheries, it is difficult to determine stock health and whether the exploitation index is appropriate. However, the index of biomass has continued to rise in spite of the increased effort in the fishery. Even from a precautionary (conservative) point of view, the ratio of commercial removals and research survey biomass estimates seems to be small in recent years, except in 2002 and 2003. There is no evidence as yet that would suggest that current levels of fishing are having a significant negative impact on monkfish.

Discussion: (Rapporteur – E. D. Richards)

- This is all spring distribution data. The fall data was also reviewed and will be shown later. Authors noted that fall data were presented and found to show a similar pattern.
- The number of sets in the strata that contain monkfish. The percentage of sets with monkfish may increase simply because the sets were in areas where monkfish occurred. The authors noted that this was a conjecture by one of the participants, but survey results have been relatively consistent in this area over time – not exceeding 700 m and consistently covering all locations bankward.
- The distribution at depth goes back to 1972. The details concerning the change in depth of the survey should be reviewed. The authors noted this was reviewed and found not to be the case (discussion included in the Research Document).
- Regarding the size of monkfish in the spring survey: the text should read 2001.
- It seems that often sets are only containing only 1-2 fish. The authors noted that precise numbers were impetrated in the presentation and in the Research Document; maximum at 12, average around 1-2 inside white hake territory.
- A voluntary cap of 3.5 m lb in management area 3NO. This error should be corrected on the Fishery Management slide. In the late 1980s, due to problems with bycatch, fishers in 3NO that exceeded their cod bycatch were prevented from fishing.
- In 2003 about 30% of the fishery was monitored.
- A bycatch restriction? What is its control aspect? Charges are laid and prosecution happens if the bycatch restriction is exceeded. There has been some enforcement measures taken over the last 5 years.
- Are there by catch restrictions for each of the five species mentioned? Yes.
- Price per pound is $1.20-1.25 in 2003 for the larger fish and $1.90 in 2002. The "head on gutted" is landed.
- Size information is from the observers.
- The fishery is a mixed fishery. However, it is suspected that monkfish is targeted. The increase in catch can be a result in the increase in the market price. The authors noted that at double the dollar per lb, this is not a suspicion.
- Currently, according to the markets skates are not worth as much as monkfish.
- From 1996-2000 there was primarily a skate fishery; however, from 2001 large monkfish was probably the target.
- With the price of shrimp being really low and crab being caught early, the mixed fishery is where the increase was seen in 2003. Crab and shrimp sectors are far larger and different. The authors did not recall a discussion suggesting a shift of effort. General groundfish licences do not include crab/shimp and vice versa. Needs to be discussed with Fisheries Management.
- The changes in 3Ps sizes in commercial catch dropping out recently is probably related to our sampling; however, 3O is presently dominating.

- The exploitation index: the 3O catch is driving the exploitation index. It is where most of the catches are taken. Anyway, the 3O/Ps boundary is meaningless to the stock. The recent peak is a result of the catch being higher than the exploitation index. During 1991-1993 the biomass was very low. The peak in biomass was in 1997.
- In 1993 there were two surveys.
- The interpretation of biomass and abundance indices may aid if the strata covered were examined. The authors noted that the strata were examined. The numbers are so low that it does take substantial hit and miss to see changes.
- In the past, closure due to excessive bycatch of restricted species has acted as a regulator for this stock but this has since changed. Observers and dockside monitors are both important. Harvesters are not going to direct for cod if they know that they will be shut down for bycatch. There is more observer coverage for monkfish than any other fishery. The high level of coverage in 2002 did illustrate that you are able to fish this fishery clean.
- Bycatch was never a regulator – therefore wording above should be changed.
- Biomass index is increasing according to the figures. All the biological information is the same as 2000 and the distribution is the same as seen in the previous assessment. The biggest change is seen in the recent fishery and what can be taken from the stock size information.
- What kind of ageing technique is used in USA? Answer: Otoliths.
- Given the limited distribution of monkfish, a table of the number of sets per stratum per year would be helpful to the distribution plots, to look at changes over the years. The authors do not agree with this opinion, as far more sophisticated GIS aids are available. Examination of the strata is a useful preliminary exploratory method.
- The tables of abundance and biomass per strata per year would be helpful as it is done for other species.
- The fishing grounds on page 15 of the presentation deck: most the fishery refers to gill nets, yet on page 16 the fishing grounds do not look so extensive. The authors note they are similar. The mixed gear map is a bit more extensive because more gears were targeting more species.
- Page 11 – Biomass and Abundance indices. The cut off between the two gear types is rather continuous. Same for the Yankee gear in 1983.
- There are a lot of strata that shouldn't been considered depending on the yearly coverage. This is an important point. Considered for what? Why?
- The coverage since the Campelen trawl has been quite consistent and thus it may not been unreasonable to conclude that there may have been an improvement in the stock over that time period. The inference is that the potential increase is probably driven by some recruitment. We really do not know the extent to which the stock may have grown; however there has been some improvement. The catch is driven is by an increase in effort and not by an increase in stock status. There is no doubt in the author's mind that the survey index has increased in recent years just as there is no doubt that fishing effort has increased and commercial catch rate has increased.

- The percent occurrence (page 6) or percent with monkfish is a straight calculation of the number of sets with monkfish (i.e. percent occurrence). There is some increase in the last few years.
- In the fishery, one should see larger fish caught than in the survey because of gear used. Recruitment into the fishery may be indicated from this information. The authors noted this was a problem. The survey data do not capture YOY at all and few juveniles. Therefore the survey is a poor indicator for recruitment.
- The catchability with the trawl would not catch small sizes. The authors agreed - it should but it did not. Therefore, this implies that the small fish are not there or escape the gear. The reason is unknown. They stick to the bottom. The commercial fishery is largely a gill net fishery. Page 12 – few males greater than 80 cm is caught. See page 21. Much greater sizes were seen in the commercial than in the survey. The authors disagreed – the difference was not all that great. The comparison needs to be made year to year. This should be investigated. With 3 years, there is not much to go on. This was done and included in the Research Document.
- Page 12 – the green line is from the US work. How easy are they to sex? Depends on the size of the fish.
- Monkfish size slide (page 13): most captures represent smaller SSB. Information may not be available to speculate on this.
- The Fishery: Page 15. The overall map of the fishery – sets per square km. There was an increase in extent with time. The focus on the gill net is located on a different slide. The mixed fishery has expanded. The traditional locations for fishing monkfish are still directing for monkfish. The big change comes down to the last year and the current year, due to the reduction in shrimp, snow crab, and the increase in monkfish value. The only indication that we have is that there is some improvement in monkfish over the years. Increase in what (price, biomass)?
- In 2001 and 2002, evidence indicated 6-8" mesh was catching a fairly high percentage of small monkfish – low value monkfish. What is small? The length frequency data from the fishery was presented.
- Bycatch regulations in 3Ps, the moratorium fisheries (e.g. American plaice) are more liberal with regards to bycatch than commercial fisheries? Why?
- If a quota is put in place, similar levels (meaning what was caught in 2003 or what was caught in 2001?) to now would be reasonable. A competitive quote may be looked at.
- The consequences of past fisheries. Relative F – Exploitation Index – Page 22. The very low catches of monkfish will give low numbers on average. Most of the variability is in Division 3O. Is the survey index more variable in 3O? It's difficult to determine given the presentation of the biomass and abundance indices plots (i.e. stacked histograms). Not really, but the two areas were presented separately showing similar patterns. This is expected since it is the same stock component. The majority of the catch is in 3O – Page 16.
- Should we recommend that a reduction of catch is advisable? Unknown. Were catch reductions discussed?

- The survey index shows some improvement, but there has been a tremendous increase in catch in the last couple years. We do not know the effect of that exploitation rate on the development of that stock in the future. Therefore, caution should be exercised.
- In more recent years there have been some increases in the biomass. The exploitation rate has increased in the last couple of years and F may be high. F is dependent on the species biology. F could be high. Why? F has increased recently and it could be high the last couple of years.
- Are monkfish mobile? Unknown. The authors noted that spring verses fall distribution data show that they do undergo a limited on bank migration in summer/fall. This was presented.
- Catches continuing at current levels could have a negative effect on the stock. Catches should not be allowed to increase above the current level. Did we actually state this? The argument couldn't be made to decrease catches.
- Given our concerns for fishing mortality at current levels, sustaining this level of catch may not be possible. High density fishing occurs over a substantial area of the fishing area.
- Can a benchmark be taken from the survey in expressing relative F? Surveys have been variable; however, there has been an increase in recent years.
- How should the precautionary approach be applied to this stock to manage the degree of risk associated?

Working Paper 14: Year Class Strength Model – B. Healey

Abstract: (none provided)

Discussion: (Rapporteur – E. D. Richards)

- Run E clarification was requested. Runs B, C, and D applied is run E.
- Run A is last year's run.
- What is the year class strength relative too?
- The first 20 years are based on the Cameron survey. A portion is also based on the Canadian, sentinel, and RV. Do we want to include all of these indices? This is something that the meeting has to decide.

DISCUSSION FOR POSSIBLE RECOMMENDATIONS

1. Objective Based Fisheries Management: Measurable objectives need to be identified for each stock. A harvester strategy, for example. Precautionary Approach, as well. How can we get Objective Base Fishery Management going again? Unaware of a pilot project – herring was suggested. Acknowledged a lack of commitment from management. Perhaps, **we should push to move forward on the objective based fisheries management**.

2. Sampling: There is no sampling of catch from Nova Scotia. There is a problem in that the long-line sampling is very inadequate in the offshore areas. This was 500 t in 2000. What is the best adjustment we can make? It is about 10% of the catch. An attempt to obtain the catch from NS has been tried. Recommendation: **Catch from 3Ps landed in NS should be obtained**. This may pose a funding problem?

3. Recommendation for implementation of the Precautionary Approach/Reference Points. Remember Feb. 2003 ZAP. Development of the Remit more fully (advice on projections?).

4. Information that exists concerning the Mixing issue. How we treat our surveys here, has to also be done in the Gulf. Split or no spilt is an advisable approach. The split is probably not the most advisable. A couple of year classes that are dominant in one area. **Fairly compelling evidence that splitting the index is not an appropriate thing to do**. We still have the problem that from time to time we are going to get a result that will not work well with the model – i.e. an irregular year. An attempt to reconcile an abnormal year. An attempt to clean up our historical data. Having the additional indices also helps (e.g. GEAC). There are clearly some Gulf cod in the middle of April in this area and we can't lose sight of that. The strong year classes observed are not outside the 3Ps area.

5. List of Research Recommendations from the monkfish presentation. Explore development of index strata for calculating biomass and abundance.

6. Catch at age from 1959 to 1976 needs to be revisited and problem with SOP rectified. Cannot run the SPA back to 1959 without this and we cannot use this data to explore stock/recruit relationships.

7. Assess whether the apparent problem in the conversion of the probability of getting a zero catch before and after the survey gear change in 1996 affects SPA calibration.

8. Explore and assess the plausibility of the fishery selectivity suggested by recent SPAs for 3Ps cod.

9. Explore and implement new methods for forecasting maturities and weights at age.

10. Expand the SPA input matrix beyond age 14 in future SPAs.

11. Have a regional pre-RAP forum/meeting that may include non-DFO personnel to explore new methodologies for assessment of various stocks.

APPENDIX I: LIST OF PARTICIPANTS

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APPENDIX II: LIST OF WORKING PAPERS

Working Paper 1: Physical Oceanographic Conditions in NAFO Division 3P during 2003 – Possible Influences on the Distribution and Abundance of Atlantic Cod (*Gadus morhua*) – E. B. Colbourne and E. F. Murphy

Working Paper 2: An Assessment of the Cod (*Gadus morhua*) Stock in NAFO Subdivision 3Ps in October 2003 - J. Brattey, N. G. Cadigan, B. P. Healey, G. R. Lilly, E.F. Murphy, P.A. Shelton, D. E. Stansbury, and J.-C Mahe

Working Paper 3: Sentinel Surveys 1995-2003: Catch per Unit Effort in NAFO Subdivision 3Ps - D. Maddock Parsons and R. Stead

Working Paper 4: Updated Estimates of Exploitation from Tagging of Atlantic Cod (*Gadus morhua*) in NAFO Subdivision 3Ps during 1997-2003 – J. Brattey and B. Healey

Working Paper 5: Cod Catch Results 2002: Year Six of the NAFO Subdivision 3Ps Fall GEAC Surveys – J. McClintock

Working Paper 6: Seasonal Variation in Abundance and Stock Composition of Atlantic Cod (*Gadus morhua*) in Placentia Bay, Newfoundland in Relation to Fisheries - L. Mello and G. Rose

Working Paper 7: Head of Placentia Bay Cod Spawning, Egg Potential and Recruitment – G. Rose

Working Paper 8: Limit Reference Points 3Ps Cod – P. Shelton

Working Paper 9: Mixing - J. Brattey

Working Paper 10: An Assessment of American Plaice Stock in NAFO Subarea 2 and Division 3K - K. Dwyer, W. M. Brodie, and J. Morgan

Working Paper 11: An Ecological Approach to the Stock – Recruitment of Divisions 2J3K American Plaice: Analytical Tools and Preliminary Results - M. Koen-Alonso and J. Morgan

Working Paper 12: Catch Rates for Vessels >35' - E. Murphy

Working Paper 13: The Status of Monkfish (*Lophius americanus* Valenciennes 1837 Lophidae) on the Grand Banks, NAFO Divisions 3L, 3N, 3O, and Subdivision 3Ps - D. W. Kulka and C. M. Miri

Working Paper 14: Year Class Strength Model – B. Healey

APPENDIX III: REMIT

Meeting of the Newfoundland Regional Advisory Process on Groundfish

The Sunporch Meeting Room, Murray's Pond Fishing & Country Club
1464 Portugal Cove Road, Portugal Cove - St. Phillips, Newfoundland and Labrador
20 - 24 October 2003
and E.B. Dunne Boardroom, Northwest Atlantic Fisheries Center, St. John's, Newfoundland and Labrador
27 - 31 October 2003

Stock Assessments

Chairperson: Dr. Ray Bowering, Research Scientist, Flatfish and Deepwater Species Section, Aquatic Resources Division, DFO, Newfoundland and Labrador Region.

Full Assessments of the stock status of the following resources will be reviewed:

- 3Ps cod
- 2 + 3K American plaice
- 3LNO and 3Ps monkfish

Oceanographic Overview

An overview of ocean climate conditions during 2003, in comparison to the historical record, will be presented.

Role of Participants

The Department is endeavouring to ensure all stock assessment meetings are open and transparent peer review process, and provide ample opportunity for knowledgeable individuals to contribute to the process. As such, attendees are expected to participate fully in the discussion and offer objective, informative, and constructive input that will aid in the process while respecting confidentiality requirements. It is not intended that participants come to RAP meetings merely to be informed about conclusions on stock status nor to 'lobby' regarding any issue.

Invited Participants

All staff - Science, Oceans and Environment Branch, DFO, Newfoundland & Labrador Region
Director, Fisheries Management, DFO, Newfoundland & Labrador Region
Director, Policy and Economics, DFO, Newfoundland & Labrador Region
Brocklehust, Gary - Fisheries Management, DFO, Newfoundland & Labrador Region
Knight, Leonard - Fisheries Management, DFO, Newfoundland & Labrador Region
Yetman, Larry - Fisheries Management, DFO, Newfoundland & Labrador Region
Perry, Jacqueline - Fisheries Management, DFO, Newfoundland & Labrador Region
Boudreau, Marcel - Institute Maureice Lamontagne, DFO, Laurentian Region
Castonguay, Martin - Institute Maurice Lamontagne, DFO, Laurentian Region
Frechet, Alain - Institute Maurice Lamontagne, DFO, Laurentian Region
Duplisea, Daniel - Institute Maurice Lamontagne, DFO, Laurentian Region
Beanlands, Diane - Bedford Institute of Oceanography, Maritimes Region
D'Entremont, Jean Guy - FRCC, Ottawa

Andrews, Ray - St. John's, NL
Bowles, William - Fish Harvester, Burgeo, NL
Briand, Daniel - Saint Pierre, France
Caines, Gordon - Rencountre, NL
Chapman, Bruce - Groundfish Enterprise Allocation Council (GEAC)
Carr, Steve - Dept. of Biology, Memorial University of Newfoundland
Coffin, David - Provincial Fisheries and Aquaculture, NL
Daley, Gary - Capt. Sea Gem, St. Joseph, NL
Decker, Dave - FFAW, Corner Brook, NL
Dooley, Tom - Provincial Fisheries and Aquaculture, NL
Edwards, Joe - Fish Harvester, Lawn, NL
Etchegary, Gus - Portugal Cove - St. Phillips, NL
Foley, Martin - Fish Harvester, Placentia Bay, NL
Green, John - Dept. of Biology, Memorial University of Newfoundland
Grant, Scott - LGL, St. John's, NL
Hardy, Kevin - Fish Harvester, Burnt Island (3Pn)
Haedrick, Dick - Dept. of Biology, Memorial University of Newfoundland
Hutchings, Jeff - Dept. of Biology, Dalhousie University
Jarvis, Harvey - Fairhaven, NL
Johnson, Brian - Provincial Fisheries and Aquaculture, NL
Kerrivan, Jerome - Jersyside, NL
King, Roland - King Fisheries Ltd., NL
Mahe, Jean-Claude - IFREMER Station de Lorient France
McClintock, John - AMEC, St. John's, NL
McCurdy, Earle - FFAW, St. John's, NL
McGrath, Kevin - St. Brides, Placentia Bay, NL
McGrath, Lorraine - Fish Harvester's Resource Centre, St. John's, NL
O'Connor, Mike - National Sea Products Ltd., NS

Pope, John - Fisheries Scientist and member of the FRCC, UK
Reid, Will - FFAW - Grand Falls - Windsor, NL
Roome, Graham - FPI, Operations Dept.
Rose, George - Marine Institute, Memorial University of Newfoundland
Sandeman, E. J. - Retired DFO Director/Scientist, St. John's, NL
Schneider, David - Ocean Science Centre, Memorial University of Newfoundland
Skinner, Mildred - Fish Harvester, Harbour Breton
Snelgrouve, Paul - Marine Institute, Memorial University of Newfoundland
Spingle, Jason - FFAW, Corner Brook, NL
Strang, Patrick - Fish Harvester, Lawn, NL
Wroblewski, Joe - Ocean Science Centre, Memorial University of Newfoundland