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**Proceedings Series 2014/030**

**National Capital Region**

**Proceedings of the Annual Meeting of the National Marine Mammal Peer Review  
Committee (NMMPRC)**

**October 7-11, 2013**

**St. John's, Newfoundland**

**Chairperson: Don Bowen**

**Editor: Christine Abraham**

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## Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may 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.

### Published by:

Fisheries and Oceans Canada  
Canadian Science Advisory Secretariat  
200 Kent Street  
Ottawa ON K1A 0E6

[http://www.dfo-mpo.gc.ca/csas-sccs/  
csas-sccs@dfo-mpo.gc.ca](http://www.dfo-mpo.gc.ca/csas-sccs/csas-sccs@dfo-mpo.gc.ca)



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ISSN 1701-1280

### Correct citation for this publication:

DFO. 2015. Proceedings of the Annual Meeting of the National Marine Mammal Peer Review Committee (NMMPRC); October 7-11, 2013. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2014/030.

### ***Aussi disponible en français :***

*MPO. 2015. Compte rendu de la réunion annuelle du Comité national d'examen par les pairs sur les mammifères marins (CNEPMM); du 7 au 11 octobre 2013. Secr. can. de consult. sci. du MPO, Compte rendu 2014/030.*

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## SUMMARY

The National Marine Mammal Peer Review Committee (NMMPRC) holds an annual meeting to conduct scientific peer-review of marine mammal issues. This approach provides the opportunity to bring together experts on marine mammals from Fisheries and Oceans Canada (DFO) with specific contributions from non-DFO experts to ensure high quality review of the scientific results and to provide sound scientific advice as the basis for the management and conservation of marine mammals in Canada. When time permits, this annual meeting is also an opportunity to review ongoing research projects and provide feedback or guidance to the scientists involved. In addition to these Proceedings, several Research Documents and Science Advisory Reports will be published as a result of the meeting.

The meeting was held at the Sheraton Hotel (St. John's, NL) from October 7 – 11, 2013. The participants invited to this meeting included individuals from DFO (Ecosystems & Ocean Science, Ecosystems & Fisheries Management, Canadian Science Advisory Secretariat); Parks Canada Agency; University of St. Andrews; University of Montreal; GREMM; Institute of Marine Research; Nunavut Tunngavik Inc.; Nunavik Marine Region Wildlife Board; Makivik Corporation; and seal harvesters.

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## SOMMAIRE

Le Comité national d'examen par les pairs sur les mammifères marins (CNEPMM) tient une réunion annuelle au cours de laquelle des pairs procèdent à un examen scientifique des questions touchant les mammifères marins. Cette approche donne l'occasion de réunir des experts sur les mammifères marins de Pêches et Océans Canada (MPO) ainsi que des experts de l'extérieur du MPO, ce qui permet d'assurer un examen de qualité supérieure des résultats scientifiques et d'offrir des avis scientifiques solides que serviront de base en vue de la gestion et de la conservation des mammifères marins au Canada. Lorsque le temps le permet, les participants à cette réunion annuelle en profitent également pour examiner les projets de recherche en cours et fournir des commentaires ou des directives aux scientifiques qui y participent. En plus de ce compte rendu, plusieurs documents de recherche et avis scientifiques seront publiés à la suite de la réunion.

La réunion a eu lieu à l'hôtel Sheraton de St. John's (T.-N.-L.), du 7 au 11 octobre 2013. Les participants invités comprenaient des membres du MPO (Sciences des écosystèmes et des océans, Gestion des écosystèmes et des pêches, Secrétariat canadien de consultation scientifique), de l'Agence Parcs Canada, de l'Université de St. Andrews, de l'Université de Montréal, du GREMM, de l'Institute of Marine Research, de l'organisme Nunavut Tunngavik Inc., du Conseil de gestion des ressources fauniques de la région marine du Nunavik, de la Société Makivik, ainsi que des chasseurs de phoques.

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**WORKING PAPER 1:**  
**Exposure of the Beluga (*Delphinapterus leucas*) to marine traffic under various scenarios of transit route diversion in the St. Lawrence Estuary**

**By:** V. Lesage, I.H. McQuinn, D. Carrier, J.-F. Gosselin, and A. Mosnier

**Rapporteur:** Nell den Heyer

**Discussion:** The Committee requested clarification of the conclusion that although change in exposure has been assessed, the impact of the exposure to the health and reproduction of beluga whales cannot be assessed (e.g., increase in stress on health or reproduction). It was noted that there were previous examples of increased boat activity resulting in the displacement of individuals, and this should be included in the working paper (i.e. Tadoussac Bay, and date).

It was noted that the analysis in the working paper did not compare the southern route to the northern route with a reduced speed limit. It was recommended that some text be added to discuss the expected change in exposure from the reduced speed limit on the northern route.

A comment about site fidelity could be considered for inclusion in the discussion: given that there is anecdotal evidence and unpublished data suggesting site fidelity, it would be relevant to explore how high site fidelity might impact the assessment of exposure.

Further, it was noted that the percent increase in exposure (of one transit of a boat) in the south versus the north might not reflect the cumulative increase in exposure for all the transits. And, although effect cannot be assessed, the north shore route, which exposes more males than the south route, is preferred. It was suggested that the status quo is better than a change in route because the change would expose more females and calves to increased noise.

Quantitatively identifying the proportion of habitat that is 'quiet' and assessing the consequences of moving the shipping lanes on this measure of habitat quality are beyond the scope of this working paper; however, some discussion of the effects of increased traffic along the south channel in known 'quiet' areas could be added to the paper. It was noted that sound refuges are discussed in the recovery document and should be acknowledged in the working paper.

**WORKING PAPER 2A (Part 1):**  
**Mortality patterns in St. Lawrence Beluga (*Delphinapterus leucas*), inferred from the carcass recovery data, 1983-2012**

**By:** V. Lesage, A. Mosnier, L.N. Measures, S. Lair, and P. Béland

**Rapporteur:** Lianne Postma

**Discussion:** The Committee suggested the authors indicate the mean age at death for juveniles in the working paper. That may make it easier to illustrate differences between males and females.

The authors noted that the numbers presented for 2008, 2010, and 2012 are unlikely to be biased by an increased effort since it was an unexpected event in 2012. 2012 numbers were similar to those in 2010 and the unusual level of strandings in calves was purposefully kept out of the media to not bias the effort.

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**WORKING PAPER 2A (Part 2):  
Trends in the trophic ecology of St. Lawrence Beluga (*Delphinapterus leucas*)  
over the period 1988-2012, based on stable isotope ratios**

**By:** V. Lesage

**Rapporteur:** Lianne Postma

**Discussion:** The Committee asked if the sample sizes were big enough to examine seasonal shifts? The authors replied that they could group years for a seasonal comparison and add this to the working paper.

The Committee also asked for clarification in the document regarding any changes in the seasonality of the long-term samples that might affect the change in signals.

**WORKING PAPER 2B:  
Summer abundance indices of St. Lawrence Estuary Beluga (*Delphinapterus leucas*) from a photographic survey in 2009 and 28 line transect surveys from 2001 to 2009**

**By:** J.-F. Gosselin, M.O. Hammill, and A. Mosnier

**Rapporteur:** Lianne Postma

**Discussion:** The Committee suggested that in terms of estimating cluster size, it is important to know how the observers defined groups, and that should be clarified in the paper.

The Committee agreed that it would be useful to put the average for each year and this would be an opportunity to show that there is a lot of variability – could there be a comparison of the CVs? The current document gives the impression that it is the single surveys that are important, where it should be the average of all surveys.

**WORKING PAPER 2C:  
St. Lawrence Estuary Beluga population parameters based on photo-identification surveys (1989-2012)**

**By:** R. Michaud

**Rapporteur:** Hilary Moors-Murphy

**Discussion:** The Committee asked if the decrease in the proportion of greys in the 2006-2012 period could be interpreted that the rate that they turn white is not matching the rate that calves turn into greys (i.e., that the grey class loses individuals as they are recruited into the white class, but the grey class is not being replenishing at this same rate)? If this were the case, the reduced proportion of greys in that time period could indicate decreased calving rates in more recent years. The author replied that it would take some time for a decrease in the proportion of calves in the population to be reflected as a decline in the proportion of greys observed as these whales turn grey over a relatively long time period. A decrease in calving rates observed in recent years is therefore not expected to show up immediately in the data in the proportion of greys observed. Possible decreased calving rates in recent years thus probably doesn't account for the decreased proportion of greys observed in 2006-2012. As well, the pool of grey animals is much larger than the pool of calves, so even if this were the case, the signal would likely be relatively weak rather than the strong signal observed in the data. If you look at the whole time series of the proportion of greys, the trend appears to be very slow changing over time.



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The Committee requested that the figure captions be clarified in the document.

The Committee asked if the decrease in the percentage of greys observed be more of an issue with sampling rather than an actual change in percentage of greys in population? And is it possible that the points are associated with a large amount of sampling error, which, if incorporated, wouldn't show the same trends? The author replied that the data on the proportion of greys is most valuable for picking up long-term changes or trends but not for changes over short time periods. It is possible that the decreasing trend observed could be accounted for by sampling error.

The Committee asked about the three age categories in the stranding data (calves/newborns, juveniles, and adults); considering that the adult stranding data show no trends (indicating that mortality rate is constant), looking at the 1994-2005 data presented, would it be reasonable to assume that the population is growing? The author replied that there has been an increase in the number of non-calf grey animal carcasses in recent years in the stranding data (i.e., there are more grey animals stranding in recent years). It is possible that this is due to an increased number of grey animals.

The proportion of grey animals observed is an indication of population growth over the long time period included in the dataset. It would be possible to extract the proportion of greys from the Bayesian population models. Also, the four peaks in the proportion of calves observed in Figure 7 are predicted by the Bayesian models - every year the model predicts a peak in pregnancy rates, an increase in calves is observed in this dataset the following year. This boosts confidence in the model results. The proportion of calves and greys are not currently included in the Bayesian model. The Committee asked if this data should be used as an additional data source in the model? The author replied that if the proportion of greys and calves are included in the Bayesian population model, they will have a big impact on the results. An assembling error would need to be calculated and included (e.g., how likely was there a calf present that was not observed?).

## **WORKING PAPER 2D:**

### **An age structured Bayesian population model for St. Lawrence Estuary Beluga**

**By:** A. Mosnier, T. Doniol-Valcroze, J.-F. Gosselin, V. Lesage, L.N. Measures, and M.O. Hammill

**Rapporteur:** Hilary Moors-Murphy

**Discussion:** The “adaptive part” of the model used a deterministic version of the general model estimating the population size and structure for the period 1913-1982. During this period, mortality and pregnancy rates were considered fixed at a value corresponding to the median of the values estimated in the “fitting part” of the model. The main objective of this part of the model was to let the population evolve conditionally to structuring elements such as the hunt and the population parameters estimated in the second part of the model. The model is thus made less sensitive to the structure of the population imposed in the initial year.

References to “stranding data” were changed to “carcass data” because some individuals recovered were drifting. These changes reflect changes done in the working paper.

The Committee asked, if the reproductive cycle has changed from a three-year cycle to two-year cycle due to some external factor such as increased food supply, then is it possible that the increased numbers of calves may not be sustainable and mortality would be expected to increase after a high pregnancy rate? Is there any reason to believe that this could be the case from the model data? The authors replied that the model can't explain the results of the shift; it

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just shows that there has been a shift. However, this is something that should be considered, as it is one interpretation of what we are seeing with the model. This population is not growing at the rate that it is expected to be growing, given that it has been protected over the last 30 years. Perhaps carrying capacity might explain why the population is so sensitive to increases in pregnancy rates.

The Committee noted that the switch from a three-year to two-year reproductive cycle may be interpreted as an indication that the population is in good shape (e.g., as was the case in North Atlantic right whales). The paper should consider this possibility and provide evidence as to why or why not this might be the case. The authors replied that there is evidence that the increased pregnancy rate is not related to good health of the population. For example, if the peak in pregnancy rates every two years was due to good health, the disproportionate increase in mortality of newborns would not be expected. As well, the visual surveys support the idea that the population is declining.

The Committee asked if the authors tried weighing down the importance of the carcass data in the model to account for the differences in sampling rates between the abundance estimates and the carcass data. The authors replied that this was considered, but there is no obvious good method for doing this. When down-sampling (thinning) the carcass data was tried, variability in the resulting estimates increased and therefore the confidence in the estimates decreased.

When the carcass data were not included in the model, all the information about the processes and mechanisms related to reproduction were lost. However, model results still indicated a decline in the population. Therefore, even when excluding the carcass data, the conclusions did not change (only the confidence intervals around the results). Thus, it makes more sense to include the carcass data.

The Committee asked, given the importance of the carcass data, how reliable do we think this is as a source of information on the population? How representative are the data of actual population mortality rates? The authors replied that effort for collecting carcass data has been relatively stable over time, but there is variability in the number of carcasses reported from year to year. Part of this variability could be related to weather conditions affecting human presence on the beaches. However, the key point is that there has not been any substantial increase in effort in recent years for obtaining carcass data, thus the increased number of carcasses is not likely a reflection of increased effort.

Prior to 2008, it was thought that the number of juveniles and calves would be an underestimate of the actual mortality because these carcasses were thought to sink. It is also probably harder to find a small, dark carcass than a large white carcass. Moreover, smaller carcasses are also more likely to be scavenged. The discovery rate of younger animals is hard to determine, but is likely to be less than that of adults.

One big gap in the carcass data is what is happening in the winter. Currently it is assumed that the trend observed in the summer is the same throughout the winter, but this might not be the case.

The other thing that needs to be checked is whether the amount of ice cover present over the winter months affects the discovery of carcasses – is there a greater chance of detecting carcasses in winter months in recent years when the amount of ice cover has decreased? This could be investigated by seeing if there is a trend of increased number of carcasses found

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earlier in the season in recent years (i.e., the last three years, which are known to have declining ice cover).

The Committee suggested that the confidence interval of the photographic abundance surveys is probably underestimated - perhaps another sensitivity analysis is required? The authors replied that this can be done; however, including a larger confidence interval around abundance estimates obtained from photographic aerial surveys will further decrease their weight in the model.

One possibility would be to introduce abundance estimates from the visual surveys as another set of data being fitted to the model. This could be done using a method for combining both visual and photographic data similar to that used in the Northern Hudson Bay narwhal population model. However, we note that aerial surveys were considered as the most reliable source of information for abundance estimates.

Given that the 2009 data point was not fitted well by the model, it was agreed that an additional sensitivity analysis would be performed by doing a run without the 2009 data point.

**WORKING PAPER 2E:  
Causes of mortality in St. Lawrence Estuary beluga (*Delphinapterus leucas*)  
from 1983 to 2012**

**By:** S. Lair, D. Martineau, and L.N. Measures

**Rapporteur:** Nell den Heyer

**Discussion:** The Committee noted that if a cancer-immune system stress link has been shown or postulated, a reference should be provided. The Committee also noted that although samples are available, genetic analysis to assess whether or not the strandings include any female-calf pairs has not been completed.

It was suggested that the plot of cancer deaths versus age would be more informative if the number of animals stranded that didn't die of cancer was also presented. Perhaps this could be included in the document, adding a statement that a certain number of beluga born during the Polycyclic aromatic hydrocarbon (PAH) discharge period died of cause of death (COD) other than cancer. Further, it would be useful to highlight in the discussion of this analysis that the age distribution is based on growth-layer groups (GLGs) and is an underestimation of age.

The Committee also noted that the value of assessing contaminant loads from population, in addition to the data presented from the stranded animals, has been considered an important avenue of research for a very long time. There are biopsy samples available to be processed.

The working paper focused on Polybrominated diphenyl ethers (PBDE) and dystocia and pup mortalities because the focus was on the recent mortality events. However, the author should acknowledge that there other possible causes of dystocia. For example, there could be synergistic effects and other toxic compounds, both anthropogenic and naturally occurring, contributing to the increased mortalities. It was also suggested that the working paper acknowledge that some compounds that are not being monitored, i.e. other emerging contaminants (e.g. fluorinated compounds) and algal toxins, might be important. Further, where carcasses are more degraded it may not be possible to rule out virus or bacterial infection, this was suggested to apply particularly to newborns, where a higher level of degradation of these stranded animals is more common.

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**WORKING PAPER 2F:**  
**Temporal trends of PBDEs in adult and newborn beluga from the  
St. Lawrence Estuary**

**By:** M. Lebeuf, M. Raach, L.N. Measures, N. Ménard, and M.O. Hammill

**Rapporteur:** Steve Ferguson

**Discussion:** The Committee noted that PBDEs have possible effect on female's reproduction as well as of mortalities of calves, but the paper focused on calf mortality.

The Committee suggested the authors update Figure 1 with more recent data for adult females (male data is not available).

The Committee suggested that the authors include an explanation regarding how the four time periods determined in the Methods.

The Committee suggested adding that contaminants can be measured from biopsy samples (under Recommended Future Work). Also, we need a study of differences in contaminants in relation to blubber depth to properly evaluate biopsy samples relative to stranded samples.

The Committee suggested adding more qualifiers to the results to indicate that the results are not definitive.

The Committee asked why the analysis of state-of-carcass over time was conducted? The authors replied that it was done to test if there is a bias or temporal trend, and this will be clarified in the Methods.

The Committee suggested adding an explanation of increased risk of toxicity with increased vulnerability (e.g., different stressors).

**WORKING PAPER 2G:**  
**Phycotoxin analysis in St. Lawrence Estuary Beluga**

**By:** M. Scarratt, S. Michaud, L.N. Measures, and M. Starr

**Rapporteur:** Steve Ferguson

**Discussion:** The Committee noted that the authors had excluded the 2010 samples, but the authors will look at them again and reconsider whether it would be worth including them in the analysis.

The Paralytic Shellfish Poisoning (PSP) toxins have been documented back in time, and the Committee suggested to add some context of time to the paper.

**WORKING PAPER 2H:**  
**Ecosystem perspective on changes and anomalies in the Gulf of St. Lawrence:  
a context in support to the management of the St. Lawrence  
beluga whale population**

**By:** S. Lair, D. Martineau, and L.N. Measures

**Rapporteur:** Steve Ferguson

**Discussion:**

The Committee inquired about the increase in abundance of herring larvae in the western Gulf (north shore greater abundance than south shore): reduced scale of estuary indicates greater

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numbers of herring larvae, but no evidence of adult herring, so it was suggested the authors link larvae to juvenile herring as food for beluga. The authors replied that these results are not published and have not been reviewed, but they can include this information in the future once the data are available.

The Committee noted there may be problems with inclusion of some of the indices (e.g. spring and fall herring) and suggested the authors chose indices to match the question. For example, using the 4T region can be considered questionable given the poor quality of data in that area. Also, on the associated figure there is one 'outlier' that provides most of the evidence supporting your decision of timing. The authors replied that spring herring were considered with large demersal fishes since both have been shown to have large decreases over the time-series. The Committee suggested that the authors be strict in what data is included, and this will improve the analysis.

The Committee asked if the authors conducted a sensitivity analysis to test the software. The authors replied that they did several runs of the test and found that STARS was sensitive to which parameters were added. The Committee suggested adding this to the document to show the sensitivity to parameter choice, and to include 5, 7, 10 scales in the document.

The Committee asked if there is a specific way to evaluate which biological variables and environmental variables should be used? The authors replied that some time-series patterns are nonlinear, and they could try using general linear model (GLM) but there are problems with discontinuity of the data sets. This was explored by the authors and something of this nature could be added to the document.

The Committee noted that we do not know what is going on in winter, and beluga behaviour in ice and possible food at that time could be very important and requires more information and should be highlighted in the advice (e.g. 70-90% ice cover preferred by beluga).

The Committee asked if the authors could include additional data (e.g., time-series of contaminants) in the analysis, or other indices of environmental quality (e.g., boat traffic)? Can you distinguish between them in the analysis? The authors replied that they could, but for this work they emphasized ecosystem variables and perhaps future analysis should include anthropogenic indices (for example, they could incorporate the time-series data from Robert Michaud).

## **WORKING PAPER 2I:**

### **Documentation of maritime traffic and boat interactions with St. Lawrence Beluga whales (*Delphinapterus leucas*) in calving areas between 2003 and 2012**

**By:** N. Ménard, R. Michaud, C. Chion, and S. Turgeon

**Rapporteur:** Lianne Postma

**Discussion:** The Committee suggested that to improve the presentation of results it would be helpful to plot them (e.g. shipping numbers changes), as it would be much easier to see the trend if it was plotted. The same could be done with the number of infractions.

The Committee suggested highlighting the areas that are well covered and the areas that are not.

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**WORKING PAPER 3A:**  
**Estimating Pup Production of Northwest Atlantic Harp Seals, *Pagophilus groenlandicus*, in 2012**

**By:** G.B. Stenson, M.O. Hammill, J.W. Lawson, J-F. Gosselin

**By:** Sheena Majewski

**Discussion:** A reviewer suggested that densities be compared for years in which pup production was more similar (e.g. 2004) vs. years where there were large differences in total estimated pup production.

There was some discussion regarding the correction factor for birth distribution. The authors expressed concern that the start date for pupping and loss of pups into water restricted use of normal distributions and that corrections could have an impact on Gulf estimates; they suggested that a sensitivity analysis could have limited impact due to the small correction applied to Gulf estimates. They did a comparison using duration of stages in 1999 to validate this model, with very similar results, but saw some differences in comparing the two models.

The Committee asked for an explanation regarding the discrepancy between the total number of photos taken and numbers read to allow the reader to evaluate potential for bias (e.g. some transect lines were too wide therefore effort was not put into reading them).

The Committee suggested that observations of whitecoats in the water should be mentioned in the report; while there were no necropsies in 2012, in the past the cause of death was drowning (likely associated with rapid changes in ice cover/substrate).

**WORKING PAPER 3B:**  
**Density Dependent and Density Independent Factors Influencing Reproductive Rates in Northwest Atlantic Harp Seals, *Pagophilus groenlandicus***

**By:** G.B. Stenson, D. Wakeham, A. Buren and M. Koen-Alonso

**Rapporteur:** Sheena Majewski

**Discussion:** There was some discussion regarding the precision of using of pelagic bottom trawl data as index for pelagic fish. There was concern regarding the choice of Capelin indices (use of acoustic data from spring 2012 vs. bottom trawl groundfish survey data from Oct-Dec 2011); suggestion that discussion regarding the rationale for this choice be included in the paper as the reasons are unclear. It was noted that ecosystem linkages will be expanded upon as a separate study. There was agreement regarding the limitations associated with use of bottom trawl data as an index for a number of pelagic species, acoustic data also had limitations.

There was a request for clarification regarding why the modeled change in fecundity rate was smooth but a collapse in capelin does not seem to affect the model (there was no sign of abortions until late 80s, close to timing of the capelin collapse).

There was some discussion regarding whether abortions are common in marine mammals (suggestion that this should be explored regularly in future analyses) or could be explored as a possible indicator that density dependence is at the extreme limits (as seen in Steller Sea lions where increased abortions have been linked to changes in prey types and abundance as part of a reproductive strategy to cut losses when nutritional stresses occur).

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**WORKING PAPER 3C:  
Updated Estimates of Harp Seal Removals in the Northwest Atlantic**

**By:** G.B. Stenson

**Rapporteur:** Sheena Majewski

**Discussion:** There was a suggestion that data from Table 11 (age structure of estimated total removals) be represented graphically, to better show changes over time.

**WORKING PAPER 3D:  
Changes in ice conditions and potential impact on harp seal pupping**

**By:** M.O. Hammill, G.B. Stenson

**Rapporteur:** John Ford

**Discussion:** The Committee suggested that the ice condition index be normalized to long-term trends in ice conditions, and thus the mean can be anticipated to drop in the future and that there will be a need to recalibrate the index periodically. The authors indicated that this will indeed need to be included in the future. Year to year comparisons will present no problem, but over 5+ years it would need to evolve with a shifting baseline.

The Chair also noted that there were probably sufficient data to estimate the area of ice occupied by a patch. This could be incorporated into the index so there may not be a need to recalibrate each year. Having information on the available extent of ice relative to normal patch size would be useful.

The Committee suggested there may also be a need to deal with changing population size since the amount of ice the seals need would change as well. The Chair suggested that a standard area of ice needed by the population could be during the 1990s, when abundance was high.

The Chair asked whether it was possible to qualitatively estimate mortality from the age structure of the population; for example, pick a year with high mortality estimates then look for that cohort in subsequent years. The authors responded that because harvest is 99% beater there is no source for data on older age classes. They did try to look at whether certain age classes weren't well represented, but this would be difficult now because in recent years it is not possible to even land on the ice to collect such data due to its poor quality.

**WORKING PAPER 3E:  
Abundance Estimates of Northwest Atlantic Harp seals and Management advice  
for 2014**

**By:** M.O. Hammill, G.B. Stenson, A. Mosnier and T. Doniol-Valcroze

**Rapporteur:** John Ford

**Discussion:** Some reviewers commented on changes in natural mortality in the model results and suggested that adult and pup mortality may be linked. The authors noted that changes in pup production have added a lot of variability to model results, and that ice mortality plus density dependent mortality of pups is linked and now has added to recent variability.

A reviewer asked whether the model's results were biased in years where there are low sample sizes for reproductive rates? The authors commented that it can indeed be a challenge with low sample sizes, as it introduces uncertainty. The reviewer asked if years with low sample size may be due to certain extrinsic factors (e.g., can't get samples) or due to issues that may also

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affect population? The authors stated that such factors (e.g. funding issue, low effort) are usually independent of factors affecting population. In 2012 and 2013, it may have been due to factors that could be affecting populations; contract harvesters are saying they are not seeing the animals nearshore so there is some concern about lack of animals.

A reviewer asked how the new method (i.e., moving away from the Brian Healey (BH) method) of smoothing in reproductive rates may be affecting the outcome of the model, noting that some estimates seem lower. The authors stated that the BH smoother method is inferior and has not been used for quite some time; the outcomes are fairly similar. The current smoother is driven by recent data on reproductive rates, especially data for 2010 and 2011. It's a weighted smoother so sample size affects results. The Chair proposed to use smoothed data for all age classes and examine how new data is affecting parameter estimates (recent pup count and reproductive rate data).

It was noted that adult mortality estimate is too low and the model is not fitting early pup production as well as it used to – question is why are these new data affecting the model so much? It was concluded that the authors explore how to incorporate reproductive rates (etc.) because of the significant impact on model fit, which has impact on the estimate of 2012 pup production and in future, which affects harvest advice; this exploration will provide a new estimate of M.

### **WORKING PAPER 4B: Northwest Atlantic Grey Seal population trends, 1960-2014**

**By:** M.O. Hammill, N. Den Heyer, and W.D. Bowen

**Rapporteur:** Thomas Doniol-Valcroze

**Discussion:** It was mentioned that some of the confidence intervals around the pup production estimates appeared skewed (e.g., Sable Island, 2010) or vanishingly small (e.g., Gulf, especially from 1995 onwards). The authors hypothesized that this could be an artifact of running too few model iterations or an interaction with the ice factor for bad ice years, and agreed this should be investigated further.

There were questions as to why this assessment yields a different outlook than in the previous year in terms of overall numbers and population trajectory. The authors replied that there are two main drivers: first, the 8+ pregnancy rates in the Gulf are not turning downwards anymore. Second, the prior on carrying capacity (K) has been relaxed – its former upper limit aimed at mimicking Len Thomas's previous assessment model, but proved to be too constraining. Allowing the model to increase K has essentially reduced the impact of density-dependence processes. It was noted that, despite relaxing the prior, the model was still trying to increase K even higher, a sign of how weak density-dependent effects were estimated to be. This emphasizes that we have little knowledge of K for this population, and underlines the importance of the next pup production estimate.

It was noted that some parameter estimates appeared to have a bimodal distribution (e.g., alpha in Coastal Nova Scotia (CNS)). This could be a consequence of not running enough model iterations or a reflection of our uncertainty about these parameters. For instance, the CNS population is known to be subsidized by other populations, which means it's not a closed population. It was asked whether the CNS population should be treated instead as part of a meta-population. The authors replied that if that was done, the Sable Island signal would then overwhelm everything else. Moreover, there would be no data to inform such a model on movements among populations. Consensus was that, at this point, keeping the CNS population separate was the most conservative option.



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A mass mortality event involving sarcocystis on one site of the CNS population was mentioned. The Committee agreed that such a localized event was unlikely to have had an impact on the population and on the reliability of the model estimates. As to what could have triggered this outbreak, it was suggested that the high density of pups over the last 5-6 years could have played a role.

When discussing harvest advice, it was proposed that any change in the age structure of the harvest should constitute an additional trigger point to re-evaluate the stock.

#### **WORKING PAPER 5:**

##### **Genetic kinship analyses of Bowhead Whales (*Balaena mysticetus*) sampled in Foxe Basin and Cumberland Sound, Nunavut, Canada**

**By:** L. Postma, L. Johnson, D. Tenkula, S. Petersen, B. Leblanc, J. Higdon, C. Matthews, and S. Ferguson

**Rapporteur:** Stephane Plourde

**Discussion:** The Committee suggested that pattern in relatedness (higher degree of kinship at a given site) could indicate strong site fidelity. The author replied that there was no evidence of site fidelity based on maternal mDNA, and noted that bowhead whales show a high degree of sex segregation in space.

#### **WORKING PAPER 6:**

##### **Preliminary investigation of genetic capture-mark-recapture to census Bowhead Whales (*Balaena mysticetus*) in Nunavut, Canada**

**By:** S.D. Petersen, L. Johnson, B. Leblanc, J.W. Higdon, D. Yurkowski, C. Matthews, L. Postma, and S. Ferguson

**Rapporteur:** Thomas Doniol-Valcroze

**Discussion:** All between-location recaptures were the result of animals that were marked in one location and then were recaptured in Cumberland Sound in a subsequent year. The Committee asked whether this could be a reflection of sampling effort over time, since Pangnirtung samples have only been taken in recent years, unlike other sites. The authors acknowledged this was a possibility and proposed checking for differences in age classes and timing of migration cycles to shed some light on the matter.

The Committee commented on the large uncertainty (SD) around the estimates. It was mentioned that that these large errors did not reflect small sample size but rather the small number of recaptures. Indeed, between-year recaptures were not included in this preliminary analysis, which aimed at showing the potential of the method. When combining all years and locations (possibly adding Greenland samples), better confidence intervals should be expected (perhaps even better than aerial surveys). Therefore, the Chair recommended including the between-year recaptures, or at least explicitly discussing their potential.

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**WORKING PAPER 7:**  
**Impacts of a flexible Total Allowable Take system on Beluga conservation  
in the Nunavik Marine Region**

**By:** T. Doniol-Valcroze, J.-F. Gosselin, and M.O. Hammill

**Rapporteur:** Stephane Plourde

**Discussion:** The Committee asked if it would be possible to check if the harvested beluga represented a random sample of the population. The authors replied that females and males were represented in a similar proportion, but whether the sample is representative of the population age structure is unknown. The Committee suggested that some structure could have been considered in the population model based on sampling sites. The authors said they needed to group catches from different communities in order to attain a minimal sample size. It has been proposed to include some general 'age classes' (sex, young, adults) in future assessments if the information is available. The authors agreed and will check the dataset for more detailed information potentially useful for the model and total allowable take (TAT) scenarios.

The Committee asked for details about error terms and the proportion of the population being hunted. The author explained that because of the paucity of data, information from other populations had to be used in the model's prior distribution, and the model is sensitive to these parameters. Survey errors were also addressed.

The Committee had questions concerning the impact of hunting strategies and catch allowance on the level of genetic heterogeneity in the population. The authors mentioned that some aspects of this problem have been assessed in recent publications, but agreed that this problem represents an issue in the management of this stock (e.g. kinship is not similar among sub-populations and groups). This discussion also included a comment about the fact that harvesting is mainly concentrated during the seasonal migration. The Committee recommended including a discussion of density-dependent processes in the paper.

The Committee also suggested that it would be useful to set a maximum TAT during the first 1-2 years in order to prevent a possible TAT=0 during year 3 because it is unlikely that a community would not hunt during Year 3. The authors replied that responding to this particular question was the responsibility of management.

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## APPENDIX 1: Terms of Reference

### Annual Meeting of the National Marine Mammal Peer Review Committee (NMMPRC)

#### National Peer Review - National Capital Region

October 7-11, 2013

St John's, NL

Chairperson: Don Bowen

#### Context

The National Marine Mammal Peer Review Committee (NMMPRC) holds an annual meeting to conduct scientific peer-review of marine mammal issues. This meeting provides the opportunity for collaborative review of scientific results by marine mammal experts from Fisheries and Oceans Canada (DFO) and from other (non-DFO) organizations. Following NMMPRC review and approval, scientific results are used to provide sound scientific advice for the management and conservation of marine mammals in Canada. When time permits, this annual meeting is also an opportunity to review ongoing research projects and provide feedback or guidance to the scientists involved.

#### Objectives

This year, the papers to be reviewed will include topics pertaining to St. Lawrence beluga population status updates, Nunavik beluga harvest advice, bowhead genetics, harp seal population assessment and harvest advice, and grey seal harvest advice (see below for individual topics).

#### Expected Publications

- Proceedings document

#### Topics

##### 1. Disturbance of beluga whales by marine traffic south of Ile Rouge, Quebec

**Context:** An area of intense maritime traffic, the St. Lawrence is also a concentration area for several marine mammal species. This combination ensures that maritime traffic involves certain risks and potentially adverse impacts on marine mammals in the area. Parks Canada Agency (PCA) and the province of Quebec have implemented the Saguenay-Saint-Laurent Marine National Parc to protect marine mammals in this area. DFO has also a proposed marine protected area in this area with the same purpose. PCA and DFO conclude that additional measures should be implemented in this area in order to reduce risks and potential impacts on marine mammals.

In this context and in the context of the integrated management of the Gulf of St. Lawrence, DFO and PCA have established a multidisciplinary working group on maritime traffic and the protection of marine mammals in the Gulf of St. Lawrence (G2T3M). This working group is composed of the main players in the maritime industry, government departments with responsibility for shipping, and experts in the field of marine mammals and in the simulation of ship movements. The group's mandate is to identify possible solutions to reduce the risks to marine mammals in the Gulf of St. Lawrence, while allowing shipping activities and without compromising security. The G2T3M agreed that it would focus initially its efforts to identify ways to reduce the risk of collisions between ships and whales.

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The Working Group wants to establish a voluntary speed reduction between the mouth of the Saguenay to Pointe-Boisvert. This voluntary action would lead to a decrease in the area of exposure of whales to shipping vessels by 6 to 31%, and a decreased risk of whale mortality in case of collisions with vessels by 22 to 65%. However, the establishment of this speed reduction zone would lead to a possible increase in the number of vessels using the southern of île Rouge as an alternate route. Thus, the request of the Working Group and DFO-Oceans is to determine whether the increase in maritime traffic tonnage in the area south of Red Island is harmful to beluga (in terms of noise and disturbance) and to assess the extent of this risk.

The maritime industry is in favor of voluntary measures to reduce speed and wants measures to be quickly implemented. Pending the outcome of the advice, it was agreed with the shipping industry that a temporary measure not involving an increase in maritime traffic south of Ile Rouge would be put forward to test the approach. The results of the advice will be taken into account in a cost/benefit analysis to assess the need to put into action the voluntary measure of speed reduction.

**Objectives:** To provide an assessment of the magnitude of the risk for beluga associated with increased maritime traffic of south of Ile Rouge in the St. Lawrence Estuary.

**Expected Publications:**

- One Research Document
- One Science Advisory Report

**2. Status of St. Lawrence Estuary beluga whales**

**Context:** The St. Lawrence beluga population is listed as Threatened under the *Species at Risk Act* and a recovery plan is in place. The last review of the population status (2007) concluded that the population over the period from 1998-2007 was stable. However, in recent years there has been an increase in the number of strandings among young-of-the-year and an apparent increase in perinatal mortalities. This increase as well as change in the age/sex structure of the animals stranded suggests that the population status may have changed; if this is true, then additional protection may be warranted and other relevant Departments should be consulted to contribute to the recovery of St Lawrence beluga, which is the most southerly population of beluga whales in the world.

**Objectives:** To provide an update of the status of the St. Lawrence beluga population. In particular, what is the information on current population size and trends, as well as an analysis of factors that are affecting the population trend, including recruitment levels, sources of mortality, trends in contaminant loads and their potential impact on mortality and fecundity?

**Expected Publications:**

- Eight Research Documents
- One Science Advisory Report

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### 3. Harp seal pup production survey, population estimates, and harvest advice

**Context:** Harp seals, *Pagophilus groenlandicus*, are the most abundant pinniped in the northwest Atlantic. The Canadian and Greenland hunt for Northwest Atlantic harp seals is the largest marine mammal harvest in the world. Since 2003, the Canadian commercial harp seal harvest has been managed under an Objective-Based Fisheries Management (OBFM) approach which incorporates the principle of the Precautionary Approach. Under this approach, precautionary reference levels are identified and are associated with pre-agreed management actions that are to be enacted if the population is estimated to decline further (Research Document 2003/067). Under OBFM, the management objective is to set harvests that will ensure an 80% probability (L20) that the population will remain above the precautionary reference level (N70). The limit reference level, for this population, also known as a conservation reference level has been set at N30. In evaluating the impacts of different harvest levels on the population, reported harvests by Canadian and Greenland hunters, losses due to animals struck but not landed or reported, bycatch in fishing gear, changes in reproductive rates, and unusual mortality due to poor ice conditions are taken into account.

**Objectives:** In 2012, a new pup-production survey of harp seals was conducted. The objective of this peer-review is to assess the new population estimates and provide advice to DFO Ecosystems and Fisheries Management (EFM) on the impact of proposed harvest levels. Specifically, EFM has requested advice to evaluate the sustainability of the following scenarios for the next 5 years (2014-2018) with an 80% confidence of remaining in the “healthy” zone:

- What is the risk that the Harp seal population will drop below 50% and 70% of  $N_{max}$  at Total Allowable Catch (TAC) levels of 300,000, 400,000, 500,000 and 600,000 annually with a composition of 30% adults / 70% beaters; 10% adults / 90% beaters; and 5% adults / 95% beaters?
- What ‘triggers’ could be used that would indicate a need to reassess the population and TAC within the multi-year management plan?

#### **Expected Publications:**

- Six Research Document
- One Science Advisory Report

### 4. Grey seal harvest advice

**Context:** There is a small commercial hunt for grey seals in the Gulf of St. Lawrence and along the Eastern Shore. Grey seals are occasionally a nuisance to commercial fisheries and some are killed under the authority of Nuisance Seal Licences. They are an important host for the seal/cod worm (*Pseudoterranova decipiens*), which also infect many groundfish species, and must be removed during processing. Grey seals are also considered by industry to be affecting the recovery of some depleted fish stocks, and to damage fishing gear. The status of the population was recently assessed in 2010.

Grey seals are managed under the Objective Based Fisheries Management (OBFM) approach for Atlantic seals which was implemented in 2003. Under this approach, populations are classified as ‘Data Rich’ or ‘Data Poor’ depending on certain data criteria. As of 2007, grey seals were considered to be ‘Data Rich’.

Under the current OBFM, the management objective is to set harvests that will ensure an 80% probability (L20) that the population will remain above the Precautionary Reference Point (PRP; N70; 70% of the maximum observed population). The Limit Reference Point

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(LRP), for this population, also known as a “conservation reference level” has been set at N30 (30% of the maximum observed population).

**Objectives:** To evaluate the following scenarios for the next five years (2014-2018) with an 80% confidence of remaining in the healthy zone:

- What is the risk that the Grey seal population will drop below 50% and 70% of  $N_{max}$  at Total Allowable Catch (TAC) levels of 50,000, 60,000, 70,000 and 90,000, 100,000 with a composition of 30% adults / 70% beaters; 10% adults / 90% beaters; 5% adults / 95% beaters?
- What ‘triggers’ could be used that would indicate a need to reassess the population and TAC within the multi-year management plan?

**Expected Publications:**

- Two Research Documents
- One Science Advisory Report

#### **5. Eastern Canada/West Greenland (ECWG) Bowhead Whale: Evidence of stock structure**

**Context:** The Eastern Canada/West Greenland (ECWG) bowhead whale population is a key fishery for DFO’s Central and Arctic Region. DFO has moved toward a Sustainable Fisheries Framework for key fisheries that addresses ecosystems factors and precautionary considerations, in support of the departmental direction toward ecosystem-based (fisheries) management. The draft Integrated Fishery Management Plan (IFMP) for ECWG bowhead whales will incorporate DFO Science advice prior to being submitted for the Nunavut Wildlife Management Board’s (NWMB) decision.

DFO Science has collected a series of biopsy samples from ECWG bowhead whales. Their analysis may provide insight into stock structuring. If there is evidence for stock structuring and kinship it may need to be considered when determining population abundance and when making management decisions.

**Objectives:** To evaluate evidence of stock structure/kinship resulting from genetics analysis of the cumulative series of biopsy samples from ECWG bowhead whales in Foxe Basin and Cumberland Sound. To inform discussions about the potential for using these analyses/results and to determine what if any advice related to this analysis should be considered in the IFMP for ECWG bowhead whales in Canada.

**Expected Publications:**

- One Research Document (the Committee may decide that a Science Advisory Document is warranted, regarding the methodology only)

#### **6. Eastern Canada/West Greenland (ECWG) Bowhead Whale: Genetic Mark/Recapture**

**Context:** The Eastern Canada/West Greenland (ECWG) bowhead whale population is a key fishery for DFO’s Central and Arctic Region. DFO has moved toward a Sustainable Fisheries Framework for key fisheries that addresses ecosystems factors and precautionary considerations, in support of the departmental direction toward ecosystem-based (fisheries) management.

Regional Fisheries Management and Science sectors at DFO have jointly developed a multi-year science and management plan that includes the evaluation of alternative methods to estimate population abundance. Among these is the genetic mark-recapture of

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individual bowhead whales from genetic analysis of biopsy samples obtained during the multi-year sampling program. This research is part of a longer term plan to evaluate the distribution and movement patterns of bowhead whales to determine the types of animals that return to certain areas and why they do so.

**Objectives:** To evaluate:

- a) the proportion of ECWG bowhead whales that have been recaptured in the multi-year collection of biopsy samples obtained from bowhead whales in Foxe Basin and Cumberland Sound;
- b) the genetic recapture frequency within and between locations, and if any bowheads been recaptured more than once; and
- c) to inform future discussions about the likelihood of reliably estimating ECWG bowhead whale abundance, using genetic-mark recapture methods.

**Expected Publications:**

- One Research Document (the Committee may decide that a Science Advisory Document is warranted, regarding the methodology only)

### **7. Impacts of a flexible Total Allowable Take system for the Nunavik Marine Region on beluga conservation**

**Context:** In 2011, the Nunavik Marine Region Wildlife Board established a total allowable take (TAT) for beluga in Nunavik. This TAT was to be effective for a three-year period, which expires at the end of the current harvesting season in 2013. Discussions on a new multi-year management plan will begin in the coming months and the Nunavik Marine Region Wildlife Board (NMRWB) intends to consider all possible options during these talks. Of particular interest is identifying a way forward that makes communities accountable to themselves in the event that overharvesting occurs in any given season. Currently, communities that respect their allocations feel “penalized” for doing so when hunting is closed, due to overharvest by other communities, before their allocated TAT is harvested. One scenario that will be explored further is whether the creation of a flexible TAT system can help to ensure that all communities are able to hunt their own allocations. The present request seeks to identify the potential impacts that such a system could have on beluga conservation efforts in the Nunavik Marine Region.

Before the NMRWB gives full consideration to the flexible TAT option, we must first consider whether such a system would increase the probability of population decline for Eastern Hudson Bay (EHB) beluga compared to current practices.

DFO recently reported that, with results from the 2011 survey included, the model indicates that removal of 60 EHB whales per year has a 50% probability of causing the stock to decline (DFO 2012/168). This suggests that 180 whales could be harvested over a 3-year period, with similar results.

**Objectives:** To evaluate:

- a) whether it is possible to use existing population models for EHB beluga, or variations thereof, to determine sustainable harvest levels and acceptable year-to-year variation of these levels; and
- b) how disproportionate harvesting (between years) would impact EHB beluga (e.g. Year 1 = 60, Year 2= 75, Year 3 = 45), while taking into account variables such as the sex and age of hunted whales.

The advice should be representative of the array of possible carry-over scenarios for a three-year period. Knowing the probability of EHB population decline under each of these

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scenarios will be useful for management purposes. The NMRWB must also consider whether there is a level of harvest that, if exceeded in any given year, poses a clear threat to the conservation of beluga (e.g. what if all 180 were harvested in a single year?).

**Expected Publications:**

- One Research Document
- One Science Advisory Report

**Participation**

- Fisheries and Oceans Canada (DFO) (Ecosystems and Fisheries Management, Ecosystem Science)
- Parks Canada Agency
- University of Montreal
- The Group for Research and Education on Marine Mammals (GREMM)
- St. Lawrence National Institute of Ecotoxicology
- Nunavik Marine Wildlife Management Board
- Makivik Inc., Nunavut Tunngavik Inc.
- Industry (fishing industry, shipping industry)
- Institute of Marine Research, Norway
- St. Andrews University, Scotland
- Other invited experts



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## APPENDIX 2: List of Participants

Name	Affiliation	Notes
Christine Abraham	DFO Science	
Don Bowen	DFO Science	
Nell den Heyer	DFO Science	
Jean-François Gosselin	DFO Science	
Garry Stenson	DFO Science	
Lena Measures	DFO Science	
Mike Hammill	DFO Science	
Thomas Doniol-Valcroze	DFO Science	
Veronique Lesage	DFO Science	
Jack Lawson	DFO Science	
Hilary Moors-Murphy	DFO Science	
Bernard Leblanc	DFO Science	
Lianne Postma	DFO Science	
Dennis Wakeham	DFO Science	
Ian Mcquinn	DFO Science	
Michel Lebeuf	DFO Science	attended via Webex for beluga papers
Arnaud Mosnier	DFO Science	
Stephane Plourde	DFO Science	
Michel Starr	DFO Science	attended via Webex for beluga papers
Michael Scarratt	DFO Science	attended via Webex for beluga papers
Catherine Couillard	DFO Science	attended via Webex for beluga papers
Jackie Kean	DFO Ecosystems & Fisheries Management	
Steve Ferguson	DFO Science	
Becky Sjare	DFO Science	
Melissa Landry	DFO Ecosystems & Fisheries Management	attended via Webex for beluga papers
Genevieve Bergeron	DFO Ecosystems & Fisheries Management	attended via Webex for beluga papers
Jenness Cawthray	DFO Ecosystems & Fisheries Management	attended via Webex for seal papers
Adam Burns	DFO Ecosystems & Fisheries Management	attended via Webex for seal papers
Guy Cantin	DFO Oceans Management Division	attended via Webex for beluga papers
John Ford	DFO Science	

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<b>Name</b>	<b>Affiliation</b>	<b>Notes</b>
Sheena Majewski	DFO Science	
Lee Sheppard	DFO Science	
Alejandro Buren	DFO Science	
Stephane Lair	University of Montreal	
Robert Michaud	GREMM	
David Lee	Nunavik Tunngavik Inc.	attended via Webex for bowhead papers
Tor Arne Øigård	Institute of Marine Research, Norway	
Nadia Menard	Parks Canada Agency	
Gregor Gilbert	Makivik Inc.	

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## APPENDIX 3: Agenda

### Meeting of the National Marine Mammal Peer Review Committee

October 7-11, 2013

Sheraton Hotel  
St. John's, NL

Chairperson: Don Bowen

Daily schedule plan as follows, but allow for some flexibility:

Start: 0830  
Break: 1030-1045  
Lunch: 1200-1330  
Break: 1500-1515  
End: 1700-1730

#### DAY 1 - Monday October 7

Time	Paper #	Topic	Rapporteur
15	n/a	Welcome and instructions for participants, rapporteurs, etc (D. Bowen)	n/a
30	WP_2a (part 1)	Mortality patterns in St Lawrence beluga ( <i>Delphinapterus leucas</i> ), inferred from the carcass recovery data, 1983-2012 (Véronique Lesage, Arnaud Mosnier, Lena N. Measures, Stéphane Lair, Pierre Béland)	Lianne Postma
30	WP_2a (part 2)	Trends in the trophic ecology of St Lawrence beluga ( <i>Delphinapterus leucas</i> ) over the period 1988-2012, based on stable isotope ratios (Véronique Lesage)	Lianne Postma
90	WP_2b	Summer abundance indices of St Lawrence estuary beluga ( <i>Delphinapterus leucas</i> ) from a photographic survey in 2009 and 28 line transect surveys from 2001 to 2009 (Jean-François Gosselin, Mike Hammill and Arnaud Mosnier)	Lianne Postma
30	WP_2i	Documentation of Maritime Traffic and Boat Interactions with St. Lawrence Beluga Whales ( <i>Delphinaterus leucas</i> ) in Calving Areas Between 2003 and 2012 (Nadia Ménard, Robert Michaud, Clément Chion and Samuel Turgeon)	Lianne Postma
lunch 1.5 hrs			
120	WP_2d	An age structured Bayesian population model for St. Lawrence Estuary beluga (Arnaud Mosnier, Thomas Doniol-Valcroze, Jean-François Gosselin, Véronique Lesage, Lena Measures, Mike Hammill)	Hilary Moors-Murphy
60	WP_2c	Population parameters based on photo-identification (R. Michaud)	Hilary Moors-Murphy

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## DAY 2 - Tuesday October 8

Time	Paper #	Topic	Rapporteur
90	WP_2h	Ecosystem perspective on changes and anomalies in the Gulf of St. Lawrence: a context in support to the management of the St. Lawrence beluga whale population (Stéphane Plourde, Peter Galbraith, Véronique Lesage, François Grégoire, Hugo Bourdage, Jean-François Gosselin, Ian McQuinn, Michael Scarratt)	Steve Ferguson
60	WP_2f	Temporal trends of PBDEs in adult and newborn beluga from the St. Lawrence Estuary (Michel Lebeuf, Meriem Raach, Lena Measures, Nadia Ménard and Mike Hammill)	Steve Ferguson
60	WP_2g	Phycotoxin analyses in St. Lawrence Estuary beluga (Michael Scarratt, Sonia Michaud, Lena Measures, Michel Starr)	Steve Ferguson
lunch 1.5 hrs			
60	WP_2e	Causes of mortality in St. Lawrence Estuary beluga ( <i>Delphinapterus leuca</i> ) from 1983 to 2012 (Stéphane Lair, D. Martineau, Lena N. Measures)	Nell denHeyer
120	WP_1	Exposure of the beluga ( <i>Delphinapterus leucas</i> ) to marine traffic under various scenarios of transit route diversion in the St Lawrence Estuary (V. Lesage, I.H. McQuinn, D. Carrier, J.-F. Gosselin, A. Mosnier)	Nell denHeyer

## DAY 3 - Wednesday October 9

Time	Paper #	Topic	Rapporteur
45	WP_7	Impacts of a flexible Total Allowable Take system on beluga conservation in the Nunavik Marine Region (T. Doniol-Valcroze, J.-F. Gosselin and M.O. Hammill)	Stephane Plourde
90	WP_3a	Estimating Pup Production of Northwest Atlantic Harp Seals, <i>Pagophilus groenlandicus</i> , in 2012 (G.B. Stenson, M.O. Hammill, J.W. Lawson, J-F. Gosselin)	Sheena Majewski
30	WP_3c	Updated Estimates of Harp Seal Removals in the Northwest Atlantic (G.B. Stenson)	Sheena Majewski
30	WP_3b	Density Dependent and Density Independent Factors Influencing Reproductive Rates in Northwest Atlantic Harp Seals, <i>Pagophilus groenlandicus</i> (G.B. Stenson, D. Wakeham, A. Buren and M. Koen-Alonso)	Sheena Majewski
lunch 1.5 hrs			

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Time	Paper #	Topic	Rapporteur
90	WP_3d	Changes in ice conditions and potential impact on harp seal pupping (M.O. Hammill, G.B. Stenson)	John Ford
60	WP_3e	Abundance Estimates of Northwest Atlantic Harp seals and Management advice for 2014 (M.O. Hammill G.B. Stenson, A. Mosnier and T. Doniol-Valcroze)	John Ford

#### DAY 4 - Thursday October 10

Time	Paper #	Topic	Rapporteur
45	WP_5	Genetic kinship analyses of bowhead whales ( <i>Balaena mysticetus</i> ) sampled in Foxe Basin and Cumberland Sound, Nunavut, Canada. (Lianne Postma, Lucy Johnson, Denise Tenkula, Stephen Petersen, Bernard LeBlanc, Jeff Higdon, Cory Matthews and Steve Ferguson)	Stephane Plourde / Thomas Doniol-Valcroze
60	WP_6	Preliminary investigation of genetic capture-mark-recapture to census bowhead whales ( <i>Balaena mysticetus</i> ) in Nunavut, Canada (Stephen D. Petersen, Lucy Johnson, Bernard LeBlanc, Jeff W. Higdon, Dave Yurkowski, Cory Matthews, Lianne Postma, and Steve H. Ferguson)	Stephane Plourde / Thomas Doniol-Valcroze
60	WP_4b	Northwest Atlantic Grey Seal Population Trends, 1960-2014 s (M. O. Hammill, C. den Heyer, W.D. Bowen)	Stephane Plourde / Thomas Doniol-Valcroze
lunch 1.5 hrs			
120	SAR_3	Harp seal Science Advisory Report	n/a
60	SAR_7	Nunavik beluga harvest advice Science Advisory Report	n/a

#### DAY 5 - Friday October 11

Time	Paper #	Topic	Rapporteur
90	SAR_1	Impacts of switching shipping lane from north to south in the St Lawrence Estuary: Science Advisory Report	n/a
60	SAR_4	Grey seal harvest advice Science Advisory Report	n/a
lunch 1.5 hrs			
120	SAR_2	St. Lawrence beluga status Science Advisory Report	n/a