Appendix 8

THE 37TH SESSION OF THE JOINT NORWEGIAN - RUSSIAN FISHERIES COMMISSION, BERGEN, NORWAY, 12-16 OCTOBER 2008

REPORT OF THE WORKING GROUP ON SEALS

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1. EXCHANGE OF INFORMATION AND SUMMARY OF SEAL CATCHES IN 2008

Norwegian catches were taken by one vessel in the Greenland Sea, whereas no Norwegian vessels participated in the southeastern Barents Sea for economical reasons. For logistical reasons, Russian seal vessels did not carry out hunting in the Greenland Sea in 2008. Russian hunting in the White Sea was conducted using three ice class vessel fitted with small catcher boats. Due to Russian fisheries rules, there was no Russian hunt of whitecoats in 2008, all pups taken were beaters.

Due to the uncertain status for Greenland Sea hooded seals, no animals of the species were permitted taken in the ordinary hunt operations in 2008. Only a few animals were taken for scientific purposes.

The 2008 TAC set for harp seals in the Greenland Sea was as recommended by ICES (i.e., levels that would stabilise the populations at present level): 31,200 1yr+ animals or an equivalent number of pups (where one 1yr+ animal should be balanced by 2 pups). The 2008 TAC recommende by ICES for the Barents Sea / White Sea harp seals was 78,200 1yr+ animals or an equivalent number of pups where one 1yr+ animal should be balanced by 2.5 pups. Due to concerns over a possible reduction in pup production in the White Sea after 2003, however, Russia and Norway agreed to reduce the TAC to 55,000 1yr+ animals at the recommendation of the Joint Norwegian-Russian Fisheries Commission. Norway was allocated a quota of 10,000 1yr+ animals (with a similar equivalence between 1yr+ animals and pups).

Norwegian and Russian catches in 2008, including catches under permits for scientific purposes, are summarized in the table below:

Area/species	Norway	Russia	Sum
GREENLAND SEA			
Harp seals			
Pups	744	0	744
Older seals (1yr+)	519	0	519
Sum	1263	0	1263
Hooded seals			
Pups	9[1]	0	9
Older seals (1yr+)	35[1]	0	35
Sum	44	0	44
Area subtotal	1307	0	1307
BARENTS SEA / WHITE SEA			
Harp seals			
Pups	0	13331	13331
Older seals (1yr+)	0	0	0
Sum	0	13331	13331
Area subtotal	0	13331	13331
TOTAL CATCHES	1307	13331	14638

[1] Animals taken under permit for scientific purposes in the Greenland Sea

2. EXCHANGE OF INFORMATION AND SUMMARY REPORTS OF RESEARCH ACTIVITIES IN 2008

2.1 Norwegian research

2.1.1 Estimation of harp and hooded seal pup production in the Greenland Sea

From 14 March to 3 April 2007, aerial surveys were carried out in the Greenland Sea pack-ice (the West Ice) to assess pup production for populations of both hooded and harp seals. The prime target species for the survey was hooded seals. Two fixed-wing twin-engine aircrafts were used for reconnaissance flights and photographic strip transect surveys over the whelping patches once they had been located and identified. One aircraft was equipped with a camera shooting colour film, while the other aircraft had a digital camera. A helicopter assisted in the reconnaissance flights, and was used subsequently to collect data for estimating the distribution of births over time.

No distinct hooded seal whelping concentrations were detected, only scattered hooded seal families and, subsequently, solitary bluebacks over a relatively large area which was denoted Patch A. Patch A was surveyed photographically using a low-density coverage method (transect spacing 5 nm, two photos shot per 1 nm along each transect). Patch B and C, both harp seal whelping concentrations which also included scattered bluebacks, were surveyed using high-density coverage methodology (transect spacing 2 nm, cameras operated to ensure about 80-90% coverage of the area along each transect line). Results from the staging flights suggest that the majority of hooded seal females whelped between 23 and 29 March. The calculated temporal distribution of births were used to correct the abundance estimates obtained. The total estimate of hooded seal pup production was 15,370 (SE = 1,675). This estimate is not significantly different from the pup production estimate obtained with similar methodology in the Greenland Sea in 2005, and is considerably lower than in 1997.

Results from the staging flights suggest that the majority of harp seal females whelped from 15 to 21 March. The calculated temporal distribution of births were used to correct the abundance estimates obtained. The total pup production estimate obtained for harp seals was 102 200 (SE = 25 400, CV = 24.9%) which is not significantly different from the estimate obtained with comparable methodology in the area in 2002.

A reduction in extent and concentration of drift ice has occurred in the Greenland Sea between Greenland and the Jan Mayen island. These changes must have resulted in substantial changes in breeding habitat for the Greenland Sea populations of harp and hooded seals. Could these changes in ice-conditions have triggered behavioral changes of such a magnitude as a relocation of breeding for at least parts of the populations? Recent low pup production in hooded seals, and new (2007) discoveries of breeding harp seals in areas outside those used historically by the

species could both be indicative of such changes. It is recommended that this is further examined by using aerial surveys to investigate whether a southward relocation of breeding has occurred for parts of the harp and hooded seal populations in the Greenland Sea. If new breeding patches are observed, this will have considerable implications for future research, management and hunting activities in the area.

2.1.2 Feeding habits of harp and hooded seals in the Greenland Sea

The feeding habits of Greenland Sea harp and hooded seals throughout their distributional range of the Nordic Seas (Iceland, Norwegian, Greenland Seas) were studied in 1999-2003. The project paid special attention to the period July-February (i.e., between moulting and breeding), which is known to be the most intensive feeding period for the two seal species. Hooded seals spend ca 40% of the year in open drift ice waters in the Greenland Sea. Results from analyses of stomach and intestinal contents collected here revealed that the hooded seal diet was comprised of relatively few prey taxa. The squid *Gonatus fabricii* and polar cod *Boreogadus saida* were particularly important, whereas capelin *Mallotus villosus*, and sand eels *Ammodytes spp* contributed more occasionally. When hooded seals occur in more coastal waters, their diet is different and contains a larger portion of demersal fish species such as redfish *Sebastes* sp. and Greenland halibut *Reinhardtius hippoglossoides*. The diet of harp seals on open drift ice waters of the Greenland Sea differed from that of hooded seals, and comprised particularly pelagic amphipods and krill, to some extent also polar cod and capelin.

During the surveys, also blubber and muscle tissues were secured from the captured animals. The sampled tissues were used for analyses of fatty acid profiles and stable isotopes. Even if the two seal species showed some overlap in diet and occurred at relatively similar trophic levels, the fatty acid profile indicated that the base of the food chain of harp and hooded seals was different. The fatty acids of harp seals originated from diatom based food chain, typically for high Arctic ice covered ecosystems. The fatty acids of hooded seals originate from dinoflagellate and the prymnesiophyte *Phaeocystis pouchetii* based food chain, which associates this species with more open Atlantic waters ecosystems.

2.1.3 Migrations of hooded seals

Both the University of Tromsø (UIT) and the Norwegian Polar Institute (NPI) have deployed satellite tags on hooded seals in the Greenland Sea in 2007 and 2008. Preliminary results indicate substantial migrations between Greenland in the west and Spitsbergen / Bear Island / Norwegian coast in the east. Single individuals has moved as far north as to 86ºN and as far south as to the Faroes.

2.1.4 Biological parameters in harp seals

There are new data from Greenland Sea harp seals to obtain estimates of female reproductive rates - the material was collected in the period 2000-2008. The new estimate of mean age of maturity (MAM) was 7 years and postpartum pregnancy rate of multiparous females was estimated at 0.79 (SD= 0.06). Both of these values represent a decrease in reproductive rates as

compared to the earlier used estimates (MAM=5.6 years, F=83.3%), but because of problems with the sampling regime it is highly questionable if the results reflect a true biological change. Due to sampling bias towards large females these changes may not reflect biological reality – the material will be supplemented with additional sampling in 2009 to solve these problems.

New data on Barents Sea / White Sea harp seal female reproductive parameters has become available. Based on female reproductive samples collected during the Norwegian harp seal hunt in the Southeastern Barents Sea in 2006, mean age at maturity was estimated at 7.2 years for the White Sea-Barents Sea stock. This probably represents a decrease in MAM as compared with the previous estimate from the early 1990s (MAM = 8.5 years), but is still high compared to values observed in the Northwest Atlantic. Average post partum pregnancy rate of multiparous females was estimated at 64% and average ovulation rate of parous females was 95%. This pregnancy rate is 20% lower than the previously reported value (84%) based on directly observed implantation rates from a small sample (n = 32). This observed decrease is probably more likely due to differences in method than an actual change in pregnancy rates.

2.2 Russian research

2.2.1 New data on pup production of harp seals in the White Sea

During 15 – 20 March 2008, traditional aerial surveys of harp seals whelping patches were carried out in the White Sea. For this purpose, a two engine aircraft Antonov-26 (An-26) named "Arktika" was used. Total duration of the aerial surveys was 36 hours and 25 minutes (5 flights which included both reconnaissance surveys and counting surveys). Reconnaissance surveys were made on 15 March. Research surveys were carried out on 16 and 17 March (only photos) and on 19 and 20 March (multispectral aerial surveys using both photo equipment and IR-scanner).

During the surveys, detailed reconnaissance flights were flown both the traditional areas for harp seal whelping in the White Sea, and in adjacent areas: in the southeastern Barents Sea - Cheskaya Bay, areas around Kolguev Island and between Kolguev and Vaigach Islands. This was done due to the very bad ice conditions in the White Sea for harp seal whelping – according to information from the Arkhangelsk Hydrometeorological Service such bad ice conditions had not been observed in the entire history (150 years) of observations.

In the new areas outside the White Sea whelping patches were not observed, only separate adult harp seals. The main whelping patches were located in the White Sea where ice conditions were most convenient for whelping (i.e., ice concentrations of 70-90%). In these areas, the ice consisted of small ice floes and big ice floes with stage of development between first year thin and first year medium.

The main whelping patches were located in the White Sea "Basin" (central part close to the Kola Peninsula) and "Gorlo" (close to the Kola Peninsula and Mezensky Bay). Surveys aimed to estimate the pup production were conducted on 16-17 and 19-20 March. Detailed information about these surveys was given in the meeting of the Joint ICES/NAFO Working Group on Harp

and Hooded Seals (WGHARP) on 27-30 August 2008 in Tromsø.

Based on the surveys 16-17 March, the total pup production was estimated as 109 536 (SE=21 103), and on the surveys 19-20 March as 123 104 (SE=28 341). This difference is probably explained by some differences in the methods of the aerial surveys. On 16-17 March only photo surveys were conducted, whetreas on 19-20 March multispectral surveys were applied. The same situation prevailed in 2004, although the differences varied (9% in 2004, 11% in 2008).

The following shjopuld be noted: In recent years, many walruses have been observed close to the whelping patches in the border between "Basin" and "Gorlo". Earlier, walruses were not recorded here. Possibly, harp seals pups may be prey for walruses. Also, many vessels tracks have been observed among whelping patches and close by in recent years due to increase ship traffic in the White Sea. This may have caused increased pup mortality as well.

2.2.2 Ecology of harp seal pups in the White Sea

Russian scientists have studied the food habits of harp seal pups during spring in the White Sea. Also, information on the timing of harp seal births in the White Sea for 1995, 1997, 1996, 1999, 2000, 2001, 2002, 2003 and 2005 has been presented. The results from this study showed that pupping could begin as early as 14-17 February and end by 10-12 March. The peaking of pupping is near the end of February

2.2.3 Biological data collection from harp seals in the White Sea

Biological data collection from harp seals were carried out during commercial vessel catches in the White Sea in the period 26 March-24 April 2008. All biological samples were taken from pups (in total 128 pups). During field work, weight and length of each pup were measured. In the future these data will be used for estimation of pup development.

2.3. Joint Norwegian-Russian work

2.3.1 Feeding habits of harp seals in open waters of the Barents Sea

In 2001 and 2002, Norwegian and Russian scientists performed an aerial survey to assess whether there was an overlap in distribution, and thus potential predation, between harp seals and capelin in the Barents Sea. This experiment is now being followed with boat-based surveys aimed to study pelagic feeding by harp seals in the Barents Sea during summer and autum.

In May/June 2004, in June/July 2005, and in May/June 2006, Norwegian surveys were conducted, aimed to study the feeding habits of harp seals occurring in the open waters of the Barents Sea. Very few seals were observed along the coast of Finnmark, and no seals were seen in the open, ice-free areas. In the nothwestern parts of the Barents Sea, however, very large numbers of seals were observed along the ice edge and 20-30 nautical miles south of this. In these areas, 33, 55 and 57 harp seals were shot and sampled (stomachs, intestines, blubber cores) in 2004, 2005 and

2006, respectively. Additionally, samples of faeces were taken from the haul out sites on the ice. Preliminary results from the analyses (which also included older material from 1996-1997) indicate that the summer consumption to a large extent was dominated by krill, whereas polar cod also contributed importantly. All sampling were performed in a period with low capelin abundance – this may have influenced the results. The total consumption increase throughout the summer, from a total of 165 thousand tons in May to 335, 435 and 820 thousand tons in June, July and August, respectively.

The collected material is now being used to develop a revised model for annual harp seal consumption of food resources, fish resources such as capelin in particular, in the Barents Sea. Harp seal consumption is now implemented in the assessment model used for capelin (Bifrost) in the Barents Sea – preliminary results indicate a considerable from harp seals on the capelin stock.

2.3.3 Joint studies of life history parameters

Historical Norwegian and Russian data which describe the trends in fertility rate and maturity at average age (MAM) for hooded seals in the Greenland Sea have recently been subjected to joint Russian-Norwegian analyses. Age at maturity was determined by fitting Richards' curves to age specific proportions of mature females in scientific samples taken by Russian scientists in the Greenland Sea pack ice in May-June in the years 1990-94. Samples from the Denmark Strait (1956-60) and South Greenland (1970-71) previously analysed by the back calculation method were also included in the present analyses. Although there were annual difference in MAM among the Greenland Sea samples a common MAM of 4.8 years could be fit to all years . Similarly, a common MAM of 3.1 year could be fit to the two Northwest Atlantic samples. This represents a temporal and a stock specific split in the sample and it cannot be concluded which factor is more important. Ovulation rates of mature females ranged from 0.68 in May 1990 to 0.99 in June 1991 and 1992, but the average ovulation rate of 0.88 was similar to previous estimates for Northwest Atlantic hooded seals. For breeding and moulting patch samples taken in the period 1986-1990, indirect measures of pregnancy rates derived from patterns of alternation in corpora formation between ovaries ranged from 0.74 to 0.97 and were significantly lower in 1987 and 1988 than in all other samples including the older data for the Northwest Atlantic stock ranging from 0.94 to 0.97.

New samples to assess biological parameters in hooded seals are now being collected (2007, 2008). These also include material to be used in studies of general health, pollution load etc.An important aim of these studies will be to address questions related to the maintained low pup production of the species in the Greenland Sea.

2.3.4 Joint studies of harp seal stock identity

New genetic analyses of population structure of Northeast Atlantic harp seals have been conducted. The material included two samples taken from Greenland Sea beaters in 2005 and 2007 and one sample taken from white coats in the White Sea in 2006. Substructuring was observed, but the pattern was not a simple split between the two Greenland Sea samples and the White Sea sample. Differentiation observed between the two Greenland Sea samples was similar

to that observed between each of these samples and the White Sea sample. Overall the results rejected panmixia of the two management stocks, but also suggested that population structure may be more complicated than a simple split between the Greenland Sea and White Sea stocks.

An observation of approximately 1000 white-coated harp seals were made on the drift ice off Southwest Greenland in April 2007. This ice drifted from the southeast coast suggesting that the seals were likely born around Cape Farwell, far from any of the traditional breeding grounds. Observations by local people indicate that whelping might have occurred there over several years. It is not obvious which whelping population these seals may be related to but the late date of pupping is more consistent with the timing of pupping in the Greenland Sea than in either the White Sea or Northwest Atlantic where pupping occurs earlier. Tissue samples were collected which, in conjunction with current studies of stock status using genetic techniques, may provide an indication of the origin of these animals.

2.3.5 Joint Research program on harp Seal Ecology

Harp seals are the most important marine mammal top predators in the Barents Sea. To be able to assess the ecological role of harp seals by estimation of the relative contribution of various prey items to their total food consumption in the Barents Sea, more knowledge both of the spatial distribution of the seals over time, and of their food choice in areas identified as hot-spot feeding areas is urgently needed. For this reason, the Joint Norwegian-Russian Fisheries Commission has decided to initiate a joint research program on harp seal ecology aimed to:

- assess the spatial distribution of harp seals throughout the year (experiments with satellite-based tags)
- assess and quantify overlap between harp seals and potential prey organisms (ecosystem surveys)
- identify relative composition of harp seal diets in areas and periods of particular intensive feeding (seal diet studies in selected areas)
- secure the availability of data necessary for abundance estimation
- estimate the total consumption by harp seals in the Barents Sea (modelling)
- implement harp seal predation in assessment models for other relevant resources (modelling)

The program was adopted by the Joint Norwegian-Russian Fisheries Commission in 2006. Although both ecosystem surveys and abundance estimation of harp seals are in progress, the core activities of the program have not yet been properly started.The parties had planned to deploy satellite transmitters on harp seals in the White Sea in late May 2008. However, the Federal Technical Committee has forbidden all satellite tagging in Russian waters. Both parties strongly regret the decision made by the committee. PINRO is still actively communicating with the Committee, but prospects of tagging in near future are regarded as small.

To ensure that tagging will take place in 2009, the parties agreed to organize a cruise in late May / early June in 2009, to deploy satellite tags on harp seals on ice in the Hopen area. The cruise will be part of the joint harp seal program, involving specialists from PINRO, SevPINRO, MMBI and IMR. However, tagging seals in the White Sea is still the most preferable approach, as it ensures

that only seals from the White Sea stock are tagged, and because tagging of different sex and age groups can easily be balanced. Therefore, the Russian part will apply for permission to tag seals in the White Sea also in 2009. The Norwegian part will provide all necessary technical information about the tags and the operation.

3. STATUS OF STOCKS AND MANAGEMENT ADVICE FOR 2009

WGHARP met at the Institute of Marine Research, Tromsø, Norway, 27-30 August 2008, to assess the stocks of Greenland Sea harp and hooded seals, White Sea / Barents Sea harp seals. The group was also asked to evaluate a proposed management strategy for harp seals in the Greenland Sea, and to assess the acceptable minimum size of a given seal population. Updated information was available for all stocks to enable WGHARP to perfrom modelling which provided ICES with sufficient information to give advice on status and to identify catch options that would sustain the populations at present levels within a 10 year period.

Management agencies have requested advice on "sustainable" yields for these stocks. ICES notes that the use of "sustainable" in this context is not identical to its interpretation of "sustainable" applied in advice on fish and invertebrate stocks. "Sustainable catch" as used in the yield estimates for seals means the catch that is risk neutral with regard to maintaining the population at its current size within the next 10 year period.

Population assessments were based on a population model that estimates the current total population size. These estimates are then projected into the future to provide a future population size for which statistical uncertainty is provided for each set of catch options. The model estimates the current total population size using historical catch data and estimates of pup production. In principle, the model can also estimate biological parameters (M_{1+}, M_0 and F), but for the populations to which the model is applied there is not enough data to provide accurate estimates of M_{1+}, M_0 and F. To compensate for the lack of data, information from other similar populations are used as input to the model in the form of a prior distribution (mean and standard deviation) for each of the parameter. The same population dynamic model was used for all three seal populations in question, but with stock specific values of prior distributions for M_0, M_{1+} and F.

The advice given by ICES in 2008 was used by this Working Group on Seals to establish management advice for 2009 to the Joint Norwegian-Russian Fisheries Commission.

3.1. Greenland Sea

The Working Group **recommends** the opening dates for the 2009 catch season to be between 1 and 10 April for catches of both weaned harp seal pups and adult moulting harp seals. The Group recommends a closing date set at 30 June (2400 GMT) for harp seals. Exceptions on opening

and closing terms may be made in case of unfavourable weather or ice conditions.

The Working Group agreed that the ban on killing adult females in the breeding lairs should be maintained in 2009.

3.1.1 Hooded seals

The Working Group noted the conclusion from ICES that the adult population is at the lowest level estimated in the historical time series.

Results from a pup survey conducted in 2007 suggest that current pup production (15 370 pups, CV = 0.11) remains low, and is significant lower than observed in the comparable 1997 survey (24 000 pups, CV = 0.28). Model explorations indicate a decrease in population abundance from the late 1940s and up to the early 1980s. In the most recent two decades, the stock appears to have stabilized at a low level which may be only 10-15% of the level observed 60 years ago. The modelling exercises included the three pup estimates as well as avialable information about age at maturity and estimates of natural mortality and natality. Incorporating these estimates into the population model produced a population estimate of 82 380 (95% C.I. 65 180-99 580) animals in 2007, or 66 890 (95% C.I. 49 950-83 850) age 1+ seals, and 15 490 young of the year (95% C.I. 12 490-18 980).

Catch estimation: ICES was requested to give options (with indication of medium term consequences) for three different catch scenarios:

- Current catch level (average of the catches in the period 2003 – 2007)
- Maintenance catches (defined as the fixed annual catches that stabilizes the future 1+ population)
- Two times the maintenance catches.

ICES still regard the Greenland Sea stock of hooded seals as data poor. Due to the restricted availability of data, ICES is not in the position to estimate future 1+ populations and can therefore not estimate sustainable catches. Instead, the concept of the Potential Biological Removal level (PBR) was used to calculate catch limits. The PBR approach identifies the maximum allowable removals that will ensure that the risk of the population falling below a certain lower limit is only 5% and that would allow a stock that dropped below this limit to recover. Using the PBR approach, the catch limit was calculated at 2 200 animals. However, ICES concludes that even harvesting at the PBR level could result in a continued stock decline or a lack of recovery. ICES therefore, concludes that the harvesting should still not be permitted with the exception of catches for scientific purposes.

The Working Group recommends that this ICES advice is implemented in future managenment of hooded seals in the Greenland Sea: Removals should still be prohibited until more information about current stock status becomes available.

3.1.2 Harp seals

The Working Group noted the conclusion by ICES that recent population size estimate is the largest observed to date.

In modelling the population, inputs to the model were pup production estimates from previous tag-recapture experiments (1983-1991) and from recent aerial surveys in 2002 and 2007:

YEAR	ESTIMATE	C.V.
1983	58,539	.104
1984	103,250	.147
1985	111,084	.199
1987	49,970	.076
1988	58,697	.184
1989	110,614	.077
1990	55,625	.077
1991	67,271	.082
2002	98,500	.179
2007	102,200	.249

As well as these pup estimates the model includes age at maturity and estimates of natural mortality and natality. Based on these inputs the model estimated the following 2007 abundance for Greenland Sea harp seals: A total population estimate of 756 200 (95% C.I. 549 800-962 600) animals, or 646 400 (95% C.I. 442 400-850 400) age 1+ seals, and 109 800 young of the year (95% C.I. 78 270-141 370).

Catch estimation: The Greenland Sea harp seals are currently regarded as data poor due to old (18-20 yrs) reproductive data, and if hunt is allowed, catch options should be based on the use of the Potential Biological Removals (PBR) approach.

Options are given for three different catch scenarios as requested by the Norwegian Ministry of Fisheries and Coastal affairs;

1. Current catch level (average of the catches in the period 2003 – 2007)
2. PBR level.
3. Two times the PBR level.

As a measure of the future development of the estimated population, the ratio between the size of the 1+ population in 2017 and 2007 (D_{1+}) is used. The estimates for the various catch levels were as follows:

OPTION #	CATCH LEVEL	PROPORTION OF PUPS IN CATCHES	TOTAL CATCH	D_{1+}		
PRIOR				Lower CI	point	Upper CI
1	Current	74.5% (current level)	5,822[1]	1.19	1.43	1.67
2	PBR	14.0%	40,383	0.60	0.93	1.25
3	2 X PBR	14,0%	80,766	0.00	0.37	0.80

The PBR removals are estimated to be 40 383. This assumes that the age structure of the removals is proportional to the age composition of the population. It is estimated that the current composition of the population includes 14% pups. A catch consisting of a higher proportion of pups would be more conservative, but a multiplier to convert age 1+ animals to pups is inappropriate. Current catch level will likely result in an increase in population size of 43% over the next 10 years, whereas catches 2x PBR levels will result in the population declining by approximately 63%. In this specific case the PBR catches are expected to lead to a slight decline (7%) over 10 years. However, with larger proportions of pups (for example 75% as it is today) in the catches this problem will disappear.

The Working Group recommend that the PBR level (40 383) be used as a basis for the determination of a TAC for harp seals in the Greenland Sea in 2009.

3.2 The Barents Sea / White Sea

The Working Group **recommends** the following terms concerning opening and closing dates and areas of the catches: From 28 February to 15 May for Russian coastal and vessel catches and from 23 March to 15 May for Norwegian sealing ships. Exceptions from opening and closing dates should be made, if necessary, for scientific purposes. The Norwegian participants in the Working Group suggest to prolong dates of harvesting to 1 July, and to determine the operational areas for the Norwegian catch activities to be the southeastern Barents Sea to the east of 20°E.

The Working Group agreed that the ban on killing adult harp seal females in the breeding lairs should be maintained in 2009.

3.2.1. Harp seal.

Russian aeroplane surveys of White Sea harp seal pups were conducted March 2004, 2005 and 2008 using traditional strip transect methodology and multiple sensors. The results obtained may indicate a reduction in pup production as compared with the results obtained in similar surveys in 1998-2003:

YEAR	ESTIMATE	C.V.
1998	286,260	.073
2000	322,474	.089

[1] 4,322 pups and 1,490 1+ animals

2001	339,710	.095
2002	330,000	.103
2003	327,000	.125
2004	233,000	.151
2005	122,400	.162
2008	123,104	.199

During the discussions in WGHARP, 4 major hypotheses were put forward as possible explanations for the dramatic decline in pup production estimates in the White Sea.

- Timing of survey to late – pups entered the water
- Pups may have been lost before the survey (either due to bad ice or drifting out of the survey area)
- Declining female reproductive rates
- Major increase in adult female mortality

The first two of these hypotheses would have resulted in an underestimate of total pup production, however if either of the latter two hypotheses were correct, then surveys would have accurately reflected pup production.

Due to the concern over the accuracy of the pup production estimates from 2004 - 2008, the stock is considered data poor. The population model was also unable to capture the sudden drop in pup production, and, therefore, was only used for obtaining a multiplier for scaling the pup production in order to obtain the population size. A multiplier of 7 was used; hence a population estimate of 861,728 was obtained. The Working Group noted the conclusion by ICES that this estimate is close yo the lowest observed in the historical time series.

Catch estimation: Based on a request from Norway, ICES gave catch options for three different catch scenarios:

- Current catch level (average of the catches in the period 2001 – 2005)
- Sustainable catches.
- Two times the sustainable catches.

However, the fit fit of the available population model for White Sea/Barents Sea harp seal population was too poor to allow the impact of the three catch options to be reliably assessed.

Since the stock was considered data poor, and the population model was considered unreliable to estimate the impact of future catches. Therefore, catch options should be based on the use of the Potential Biological Removals (PBR) approach. Using this approach, a PBR level of removal would be 21,881 animals in the White and Barents Sea. This assumes that the age structure of the removals is proportional to the age composition of the population (i.e. 14% pups). A catch

consisting of a higher proportion of pups would be more conservative, but a multiplier to convert 1+ year-old animals to pups is inappropriate.

In principle, the Working Group recommend that the PBR level (21 818) be used as a basis for the determination of a TAC for harp seals in the White Sea / Barents Sea in 2009.

In order to continue the development of hunting activities in the White Sea, the Russian party suggested that the TAC for 2009 should be set at 35 000 seals – the Norwegian party had no objections to this. WGHARP has recommended that substantial work be done in order to get a better understanding of what has caused the potential problems for harp seal recruitment in the White Sea. This increased effort should also include a new aerial survey in 2009. The Working Group ***strongly support*** this.

3.2.2 Other species

The Working Group agreed that commercial hunt of bearded seals should be banned in 2009, as in previous years, but it **recommend** to start catch under permit for scientific purposes to investigate results of long time protection.

3.3 Evaluation of a proposed management strategy

A Precautionary Approach framework is developed by ICES for the management of harp and hooded seals. Within this framework, conservation, precautionary and target reference points can be identified and linked to specific actions.

Harp and hooded seals are commercially exploited to varying levels throughout the North Atlantic. The availability of scientific information concerning the status of these resources (abundance, reproductive and mortality rates) also varies between stocks. The suggested conceptual framework for applying the PA to Atlantic seal management requires that "data rich" and "data poor" stocks be treated differently when biological reference points are to be defined. Data rich stocks should have data available for estimating abundance where a time series of at least five abundance estimates should be available spanning a period of 10-15 years with surveys separated by 2-5 years, the most recent abundance estimates should be prepared from surveys and supporting data (e.g., birth and mortality estimates) that are no more than 5 years old, and the precision of abundance estimates should have a Coefficient of Variation about the estimate of about 30%. Stocks whose abundance estimates do not meet all these criteria are considered data poor.

ICES has concluded that all hooded seal stocks are at present data poor. Reproductive data for the Greenland Sea harp seal stock needs to be updated for stock to be regarded data rich – it is therefore currently being classified as data poor even though there are sufficient pup production estimates to consider it data rich. There have been 8 pup production surveys since 1998 in the White Sea. The quality of the pup surveys is sufficient to consider the stock data adequate. Also, there are recent reproductive data for this stock. Nevertheless, due to the concern over the accuracy of the pup production estimates from 2004 - 2008, the stock is considered data poor by

ICES.

For a data rich species, a framework including two precautionary and one conservation (limit) reference level are proposed (Fig. 1). All reference levels relate to the pristine population size, which is the population which would be present on average in the absence of exploitation, or a proxy of the pristine population (e.g. maximum population size historically observed, N_{max}). A conservation or lower limit reference point, N_{lim}, identifies the lowest population size which should be avoided with high probability. Between those points it is suggested that two precautionary reference points are used as decision signposts for increasingly restrictive management to be introduced when the population approaches the conservation limit. In accordance with practices in the Western Atlantic ICES recommends that the limit reference point (N_{lim}) could be either 30% of the historical accurate maximum population estimates or should be set independently using IUCNs vulnerable criteria.

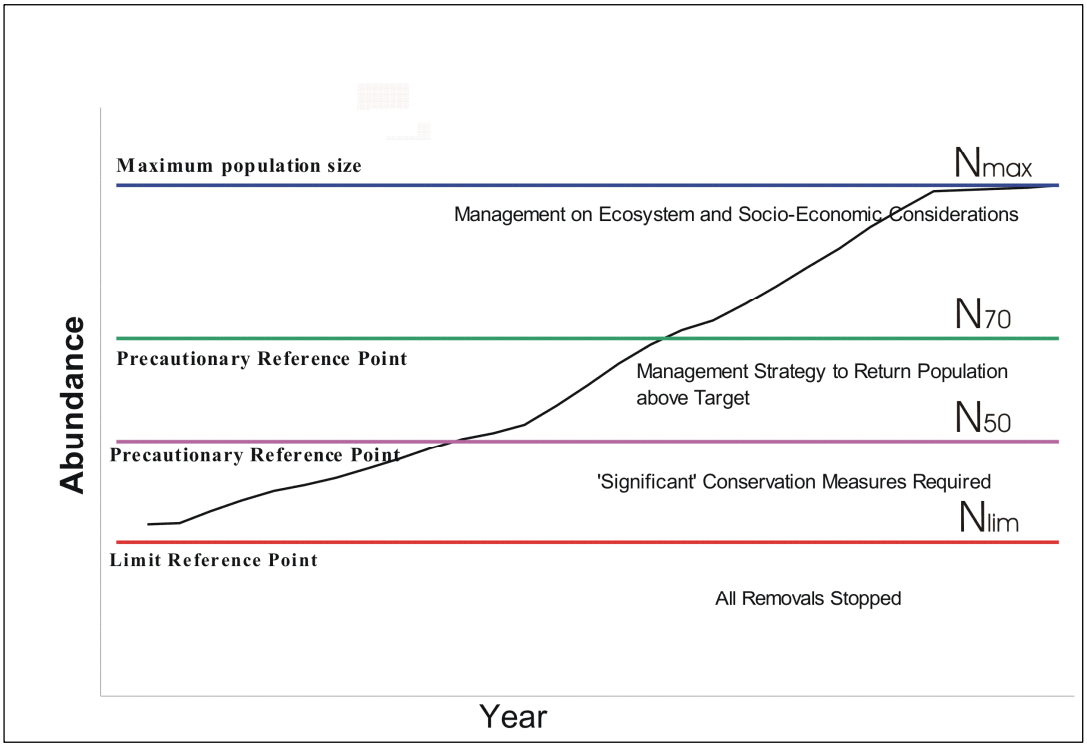

Figure 1 Reference points for a data rich seal stock.

The first precautionary reference level could be established at 70% (N_{70}) of $N_{max.}$ When the population is between N_{70} and N_{max}, harvest levels may be decided that may stabilise, reduce or increase the population, so long as the population remains above the N_{70} level. When a population falls below the N_{70} level, conservation objectives are required to allow the population to recover to above the precautionary (N_{70}) reference level. N_{50} is a second precautionary reference point where more strict control rules must be implemented, whereas the N_{lim} reference

point is the ultimate limit point at which all harvest must be stopped.

The Norwegian Royal Ministry of Fisheries and Coastal Affairs has requested ICES to evaluate a suggested management strategy for harp seals in the Greenland Sea. The strategy was based on the framework described above, and it proposed that the long term stock size aim for harp seals in the Greenland Sea should be 430,000 animals, which was 70% of the stock estimate defined by ICES by the time the request was forwarded. Dependent on the stock size the annual TAC should be as follows:

Stock size (1+)	Annual TAC
Larger than 430,000	2.0 * sustainable catches
Between 300,000 and 430,000	0,75 * sustainable catches
Between 200,000 and 300,000	0,5 * sustainable catches
Under 200,000	0 (no hunt)

Sustainable catches should be defined as the fixed annual catches that stabilize the future 1+ population. The Norwegian proposed suggested that if the stock size was estimated to be greater than 430,000 animals then the annual TAC should not be changed more than 25% compared to the catches the previous year; such a limitation was not applied when the stock estimate is under 430,000 animals. In that case the exploitation pattern shall be as in the previous year. This implies that the catches shall be composed of 25% 1+ animals and 75% younger animals.

In response, ICES states that the proposed Norwegian management strategy for Greenland Sea harp seal cannot be considered to be in accordance with the precautionary approach because the situation for the population is considered to be data poor. In this case, ICES recommends that the TAC be set according to the PBR approach when the population is above N_{lim}, or zero when population size is below N_{lim}.

However, ICES also considered the appropriateness of the proposed management strategy should data improve such that the situation is no longer data poor. The proposal aligns well with the four-tier precautionary management system that ICES has recommended previously (see Fig. 1), although the values used to define the levels should be updated to reflect the most recent estimate of population size (e.g., 70% of the current population size estimate is 529,000 animals rather than 430,000).

While the four-tier approach is appropriate, ICES has the following concerns about the proposed TACs in the context of the precautionary approach:

1. A TAC of twice the sustainable level for the first tier (i.e., above N_{70}) will reduce the population rapidly (within 5 or 6 years, or less) to N_{70}, with a risk of the population falling into the second tier. An option is to design the TAC for the first tier to satisfy specific risk criterion (e.g., 80% probability of remaining above N_{70} over a 10 year period).
2. The TACs for the second and third tiers only allow a slow population recover to N_{70}. An option is to design the TAC for these tiers to satisfy a specific recovery objective with a risk criterion (e.g., 80% probability of recovering to the next higher tier within 10 years).

3. The TACs do not take into account the uncertainty in population estimates. TACs should be set more cautiously when data is poor.
4. Any allowable catch should be contingent on an adequate monitoring scheme to detect adverse impacts before it is too late for them to be reversed, particularly if the TAC is set at a level where a decline is expected (e.g., a TAC twice the sustainable level as proposed for the top tier).

The Working Group appreciate the conclusion from ICES that the proposed management strategy framework could be applied to the Greenland Sea harp seal stock. However, the group emphasize that the definition of N_{max} should not be fixed permanently to a special value in that long term and short term changes in important environmental conditions may necessitate adjustments.

3.4 A "minimum-sized" seal stock

The Norwegian Royal Ministry of Fisheries and Coastal Affairs has also requested ICES to assess a possible existence of an acceptable minimum size of a given seal population. In response, ICES concluded that the ideal level at which the population "should be" would depend primarily upon the management objectives proposed. For example, if the objective is to maintain a harvest of a given level, the population required to provide this yield can be estimated using the population models developed.

If the management objective is to reduce the population to a minimum level, ICES has identified N_{lim} (equal to 30% of the unexploited population size) as the critical limit below which a further reduction in a population may cause serious and irreversible harm. Since the unexploited population size is unknown, N_{lim} is estimated as 30% of the maximum observed population size. As noted above, for Greenland Sea harp seals the current estimate of 756,200 is the maximum observed. Therefore N_{lim} is estimated as 227,000 animals for this stock. ICES advises that this estimate of N_{lim} should be regarded as the minimum size of the Greenland Sea harp seal population that is considered sustainable. At this population size, a sustainable catch of Greenland Sea harp seals may be in the order of 1,000 seals, although ICES recommend that for a population at or below N_{lim} there should be no catch.

ICES regards 70% of the unexploited population size as the population size associated with the maximum sustainable long term average catch (synonymous with the "maximum continued yield" in the request). For Greenland Sea harp seals this population size is estimated as 529,000 animals. The PBR approach should be used to estimate a sustainable catch in a data poor situation. With better data, the maximum sustainable long term average catch could be estimated more precisely. The maximum sustainable long term average catch of harp seals in the Greenland Sea at this stock level is probably in the order of 20,000 animals annually.

4. PROSPECTS FOR FUTURE SEALING ACTIVITIES

4,1 Sealing symposium in Tromsø in 2008

The prospects for future sealing in the North Atlantic have been discussed by the Joint Norwegian-Russian Fisheries Commission (JNRFC) in recent years. There are concerns over the current lack of ability on both the Norwegian and Russian side to fulfill given seal quotas. Also, the multispecies perspective of seal management is a matter of concern in the two countries. The main problem for the sealing industry in the last 2-3 decades has been the market situation. Protest activities initiated by several Non-governmental Organizations in the 1970s destroyed many of the old markets for traditional seal products which were primarily the skins. The results have been reduced profitability which subsequently resulted in reduction in available harvest capacity (e.g., the availability of ice-going vessels) and effort. With the present reduced logistic harvest capacity in Norway and Russia it is impossible to take out catches that would stabilize the stocks at their present levels. Unless sealing again becomes profitable, it is likely that this situation will prevail.

In September 2003, the symposium "Prospects for future sealing activities in the North Atlantic" was held (based upon an initiative from JNRFC) in Archangelsk, Russia with participation from Canada, Greenland, Norway and Russia. The meeting was successful, and at its last meeting in St Petersburg, Russia, in October 2007, JNRFC decided that a new symposium should be arranged in 2008. This was the background for the symposium "Prospects for future sealing in the North Atlantic" which was arranged at the Polar Environmental Centre in Tromsø, Norway, on 25 and 26 August 2008. The symposium was an arena where experts involved in the various aspects and branches of sealing could meet. The meeting was primarily for people from all levels of the sealing industry, including participants with knowledge of both the sealing itself, the products and their application, and the market prospects. Themes addressed focussed on market prospects for traditional products (skins), but also the possibility to introduce "new" products (meat- or blubber-based) on the markets were assessed. Participation from other seal hunting nations included Canada (where a successful seal hunt is currently sustained), Greenland and Finland. To ensure input about the resource bases and management, the symposium included participants from management authorities and science. The symposium was open for participation to the public, and had the following program:

25 August 2008

1100-1110 Opening
Ernst Bolle, Directorate of Fisheries, Norway

1110-1145 Opening address
Secretary General Jørn Krog, Norwegian Ministry of Fisheries and Coastal Affairs, Oslo, Norway

1145-1245 The resources (Chair: Ernst Bolle)

The northeast Atlantic seal resources, their management and their role in the ecosystem
Dr Tore Haug, Institute of Marine Research, Tromsø, Norway

The status, management and ecological role of harp and hooded seals in Canada
Dr Garry B. Stenson, Department of Fisheries and Oceans, Newfoundland, Canada

1245-1345 Lunch

1345-1715 The sealing (Chair: Vladimir Zabavnikov)

The traditional Russian hunt: Organisation, status and prospects
Benedikt Gofman, Chapoma, Murmansk
Changing the Russian hunt: the new boat-based approach
Sergej Pocholov, Arkhangelsk
The hunt in Norway: Management objectives, regulations and organisation
Halvard P. Johansen, Norwegian Ministry of Fisheries and Coastal Affairs, Oslo
Norwegian sealing as seen from a sealers perspective
Bjørne Kvernmo, Alta, Norway
The seal hunt in Greenland: Organisation, status and prospects
John Biilmann, KNAPK, Greenland
Todays successful seal hunt in Canada: Organisation, status and prospects
Tom Fowler, Department of Fisheries and Oceans, Newfoundland, Canada

1930 Symposium Dinner

26 August 2008

0900-1120 The products (Chair: Paul Jensen)

Traditional products from the seal hunt: status and prospects
Director Knut Nygaard, CGRieberSKINN AS, Bergen, Norway
Products from seals – potentials and possibilities
Mona Gilstad, Vega, Norway

Can seal oil contribute to better human health?
Professor Bjarne Østerud, University of Tromsø, Norway

1120-1400 Seals and the world (Chair: Jørn Pedersen)

Why arrange a sealing conference in Vaasa, Finland – some thoughts after the international "Seals and society" conference in 2007.
Eero Aro, Finnish Game and Fisheries Research Institute, Helsinki
Sustainable harvest of marine resources: should seals and fish be treated different?
President Eugene Lapointe, IWMC World Conservation Trust, Florida, USA
EU perspective of seals and sealing
Fisheries Counsellor Paul Oma, Mission of Norway to the EU, Brussels, Belgium
Anti-sealing organizations – who are they and what are their arguments?
Georg Blichfeldt, Olsborg, Norway

1400-1500 Lunch

1500-1645 Does sealing in the North Atlantic have a future?

A discussion between the audience and a selected panel including Halvard P. Johansen, Bjørne Kvernmo, Vladimir Zabavnikov, Tom Fowler, Knut Nygaard and Eugene Lapointe
The discussion was lead by Gunnar Sætra, Fiskeribladet Fiskaren, Tromsø, Norway

1645-1700 Concluding remarks

Liv Holmefjord, Directorate of Fisheries, Bergen, Norway

The symposium started with talks about the resource base. Obviously, scientists work closely with their management research, and have the same opinion on crucial issues. But there is still a crucial need to increase current knowledge on impact from different sizes of the seal populations on the rest of the ecosystem (and through that view on the "optimal" population size), but also questions like effect of climate changes and so on.

The symposium continued with talks on the actual hunting and regulations - with a glimpse at the past, but with focus on the future. There is a well functioning sealing industry in Canada, optimism among the sealers in Russia and maybe some pessimism in Norway. It is important to continue to develop both the way hunting operations are carried out and other relevant regulations regarding the hunt (including inspection and enforcement) – this is important because of animal welfare issues, but also to ensure that all relevant knowledge and technology to develop the hunting itself is used. Cooperation to find "best practice" should be encouraged, even though the conditions and framework may differ between Canada, Greenland, Russia and Norway.

Next symposium topic was "the products". Local producers with good ideas obviously exists, but there is also a need to find a way to go from a sort of hobby to more of a commercial production. This can only be done through better marketing and new ways to distribute the products to markets that are willing to pay for them. Larger producers seem to be optimistic about the future demand for their products – if issues related to market access are solved. And of course; all different stages in the value chain have to be profitable.

It was evident, both form the many good talks and from the final symposium discussion, that sealing has the "eyes of the world" on it. Arguments and protests against sealing must definitely be taken serious. Sealing activities must continue to be transparent and give all the information available on the scientific knowledge (for example the status of the seal population), the killing methods, the regulations and the way control and enforcement are conducted. That is the only way to secure that decisions made are based on knowledge, and not assumptions or maybe feelings. And of course; people and nations involved in sealing have to act in a reliable way. If it is said that "we have a humane killing method", we have to carry out the hunt with methods that are in accordance with this statement. It is also necessary to follow up the discussions with EU upon the implementing of their ban against trade in seal products.

In summary, it was concluded that it would be a complicated task to keep up and maybe increase the harvest of seals in the North Atlantic. But it was the general feeling among participants that the two days of symposium in Tromsø had revealed a common understanding of the challenges – and that cooperation would be necessary in order to come up with good answers.

4.2 Recent sealing in the White Sea

The Working Group appreciates the established Russian-Norwegian cooperation about sealing activities in the White Sea (the Pomoroye company) with introduction of boat based hunting of harp seal beaters, and **recommend** that this activity receives all necessary recognition and support

from the authorities of both nations. Pomoroye has requested some help from Russian fisheries authorities with regard to:

- allocation of specific quotas to the company,
- possibility to receive help from ice-breakers if needed during the season,
- extension of the hunting season to the end of June,
- economical support to further develop the White Sea hunt.

The Working Group is not in the position to make decisions regarding these issues, but **recommend** that Russian fisheries authorities respond to the Pomoroye requests in a way that secures continuation of the new boat based sealing activity in the White Sea.

The Working Group emphasized the need to consider harp seal quotas in an ecosystem perspective which would require a complete use of the quotas given by ICES. A complete use of current harp seal quotas in the White Sea will be of considerable importance for the income of people living in the White Sea area, it will secure the maintainance of sealing competence in the area, and it will promote Russian-Norwegian cooperation in the Barents and White Seas.

Upon request from Pomeroye to get a contact person close to Russian fisheries authorities in Moscow, one of the Russian Working Group members (Gennady Antropov; srkr2003@mtu-net.ru) volunteered to take this role.

Pomeroye is aiming at implementing killing methods, regulations and the conduction of control and enforcement along the same lines as in the Norwegian hunt. Pomeroye is also considering to permit shooting of seals tghat are in the water. Although such hunting methods are allowed in the Canadian hunt, the Working Group emphasize that in the Norwegian regulations harp seals can only be killed on the ice.

5. RESEARCH PROGRAM FOR 2009+

5.1. Norwegian investigations

5.1.1 Estimation of harp and hooded seal pup production in the Greenland Sea

Data for pup production estimation were obtained from both harp and hooded seals in the Greenland Sea in March/April 2007. Final analyses and publication of these data will be an important Norwegian activity in 2009.

5.1.2 Seal physiology and tagging

On research cruises to the Greenland Sea in March/April 2009, various physiological parameters of harp and hooded seals will be studied. Also, data from satellite based tags, deployed on hooded seals in the area in 2007 and 2008, will be analysed.

5.1.3 Collection of biological material from the commercial and local hunt and dedicated surveys

Biological material, to establish age distributions in catches as well as health, reproductive and nutritive status of the animals, will be collected from commercial catches of harp seals both in the southeastern Barents Sea and in the Greenland Sea in 2009. In the Greenland Sea, samples will also be obtained also from local Greenland hunters.

5.1.4 Harp seals taken as by-catches in gillnets

Provided harp seals invade the coast of North Norway also during winter in 2008, biological samples will be secured from animals taken as bycatches in Norwegian gill net fisheries.

5.2.Russian investigations

5.2.1 Russian research on the White Sea/Barents Sea harp seal population

Plans to carry out annual accounting multispectral aerial surveys with aim to use these data for determination of population size by modelling, and in Joint Norwegian-Russian Research Program on Harp Seal Ecology. This research will be carried out under recommendations of ICES WGHARP and JRNFC 37 session.

Research on harp seal reproductive biology is planned to be carried out in the White and the Barents Seas. The final aim is study of harp seal biological data (mortality, maturity, birth rate, morphological and physiological indexes, etc.). During springtime work will be continued on pup mortality estimation in the White Sea. Plans to continue research on harp seal feeding in the White and the Barents Seas during spring and summer times. This research will be carried out under the program and recommendation of WGHARP and JRNFC 37 session.

5.3. Joint Norwegian - Russian investigations

5.3.1 Feeding habits of harp seals in open waters of the Barents Sea

In 2001 and 2002, Norwegian and Russian scientists performed an aerial survey to assess whether there was an overlap in distribution, and thus potential predation, between harp seals and capelin in the Barents Sea. This experiment was followed with boat-based surveys aimed to study pelagic feeding by harp seals in the Barents Sea during summer and autum in (2004-2006), and the results from these investigations are now being analysed and prepared for presentation/publication.

5.3.2 Tagging of Barents Sea / White Sea harp seals with satellite tags

The successful joint Norwegian-Russian 1996 project (and a similar project during harp seal

breeding in 1995) with tagging of harp seals with satellite transmitters in the White Sea is planned to be continued with final analyses of data and joint publication of results in 2006/2007. The Working Group **recommends** that satellite tagging experiments with harp seals in the White Sea are continued jointly between Norwegian and Russian scientists with the purpose to study distribution, migrations and daily activity of the seals. This activity is part of the joint research program, and will give an important contribution to a better understanding of the temporal and spatial distribution of the seals, which is important input data when their total consumption of marine resources in the Barents Sea is to be assessed. It is important that animals of different sexes and ages are tagged. In 2004 a joint research program (written by Drs Arne Bjørge, Mette Mauritzen and Vladislav Svetochev) that ensures a proper design on the experiment, has been developed. The program describes the background for the project, the types of equipment to be used, how the field work will be carried out, and the total costs. The program is assumed to run for 5 years, with 15 tags being deployed every spring (i.e., immediately after the moulting period). First deployment of tags will be conducted in the White Sea, alternatively in the Northern Barents Sea, in 2009. It is important that both young immature seals and adults are tagged each year.

5.3.3 Life history parameters in seals

Upon request, forwarded during meetings of the Joint Norwegian-Russian Fisheries Commission, one Russian scientist was invited to participate in scientific work on Norwegian sealers during March-April in 1997-1999 in the southeastern part of the Barents Sea, and in 2000 in the Greenland Sea. This Norwegian-Russian research cooperation is encouraged, e.g., by extending an invitation to Russian scientists to participate on Norwegian sealers in the southeastern Barents Sea and/or in the Greenland Sea also in the future. This would enable coordinated and joint sampling of new biological material. The Working Group **recommend** that Russian scientists are offered the possibility to participate in Norwegian research activities in 2009. If Russia can realize scientific or commercial vessel trips in the White, Barents and Greenland Seas, invitation for participation of Norwegian scientists is desirable.

5.3.4 Reconnaissance of possible new harp and hooded seal breeding patches in the Greenland Sea

A reduction in extent and concentration of drift ice has occurred in the Greenland Sea between Greenland and the Jan Mayen island. These changes must have resulted in substantial changes in breeding habitat for the Greenland Sea populations of harp and hooded seals. Could these changes in ice-conditions have triggered behavioral changes of such a magnitude as a relocation of breeding for at least parts of the populations? Recent low pup production in hooded seals, and new (2007) discoveries of breeding harp seals in areas outside those used historically by the species could both be indicative of such changes. The Working Group **recommends** that this is further examined by using aerial surveys to investigate whether a southward relocation of breeding has occurred for parts of the harp and hooded seal populations in the Greenland Sea. If new breeding patches are observed, this will have considerable implications for future research, management and hunting activities in the area.

5.4. Necessary research takes

For completion of the proposed Norwegian and Russian research programs, the following numbers of seals are planned to be caught under special permits for scientific purposes in 2009:

Area/species/category	Russia	Norway
Barents Sea / White Sea		
Whelping grounds		
Adult breeding harp seal females	500	0
Harp seal pups	500	0
Outside breeding period		
Harp seals of any age and sex	2300	200
Greenland Sea*		
Whelping grounds		
Adult breeding harp seal females	0	100
Harp seal pups	0	100
Adult breeding hooded seal females	0	100
Hooded seal pups	0	100
Outside breeding grounds		
Harp seals of any age and sex	0	100
Hooded seals of any age and sex	0	200

6. OTHER ISSUES

6.1. Observations of marine mammals on the ecosystem surveys

The protocols followed by the Russian and Norwegian marine mammal observers on board the ecosystem survey vessels has differed in previous years, thus hampering any combined approach to investigate variation in marine mammal distributions and trophic relations. From 2008 on, the parties have shared protocols and agreed upon a common protocol for marine mammal observers to be used during the ecosystem cruise.

Distributions of fin, humpback and common minke whales were recorded synoptically with distribution of pelagic fish during cruises in the Barents Sea (BS) annually in 2003 – 2007, in late summer. During these years, the BS was recognized by low abundances of capelin, a key prey species. Capelin occurred along the polar front in central areas, while abundant polar cod occupied the northern Arctic waters and abundant herring and blue whiting occupied the southern and south-western Atlantic waters, respectively. All three whale species inhabited both Arctic and Atlantic waters, with highest densities in northern Arctic waters, north of the front. In the north, the baleen whales aggregated at medium densities of capelin and polar cod, at the rim of the fish distributions. Areas with high pelagic fish density were not used by the baleen whales, suggesting that, at least in years with low capelin abundance, i) northern baleen whales in Arctic waters target other prey than pelagic fish, i.e. zooplankton, and ii) foraging at the rim of the fish distributions, the whales respond to prey depletion within high density areas of pelagic fish. In that case, pelagic fish in Arctic waters are competitors, structuring the baleen whales' distributions. In the south, both fin and minke whales aggregated at high herring and blue whiting densities, indicating that pelagic fish is preyed upon in this area. Nevertheless, the low density of baleen whales in southern BS suggests that the abundant pelagic fish stocks in the south experience relatively low predation pressure by baleen whales, also when capelin abundance is low. The results pinpoint the importance of studying processes of trophic and competitive interactions on large scales, and demonstrate the value of synoptic cruises for studying such processes. The Working Group **recommend** that observations of marine mammals continue on ecosystem surveys. The Working Group also agree that additional aerial survey provide valuable information and should be performed. The aerial survey is particularly valuable if covering areas north and east of the areas covered by the vessels. More than 2 million harp seals inhabit these areas, and they are not observed from the vessels during the ecosystem cruises.

6.2 Abundance estimation of grey seals

In Norway grey seal pup production surveys aimed to cover all the breeding colonies along the entire coast are at present (2006-2008) being conducted. The Working Group **recommend** that the Russian grey seal breeding colonies at the Murman Coast should be covered during the same period. The Ainov islands were partly surveyed in 2006. It is recommended that these surveys are completed, and that also the Seven Islands should be surveyed in 2008-2009. Ideally each colony should be visited three times (minimum twice) during the breeding period, and the use of small aircrafts and/or helicopters are recommended..

7. APPROVAL OF REPORT

The English version of the Working Group report was approved by the members on 15 October 2008.