Appendix 8

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REPORT OF THE WORKING GROUP ON SEALS

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1. EXCHANGE OF INFORMATION AND SUMMARY OF SEAL CATCHES IN 2010

Norwegian catches in the Greenland Sea in 2010 was taken by one single vessel, whereas no Russian seal vessels participated in the area. Due to the uncertain status for Greenland Sea hooded seals, no animals of the species were permitted taken in the ordinary hunt operations in 2010. Only some animals were taken for scientific purposes. The 2010 TAC for harp seals in the Greenland Sea was set at 42 400 1+ animals (where 2 pups balance one 1+ animal), i.e. the removal level that would reduce the population with 30% over the next 10 year period.

A possible reduction in harp seal pup production in the White Sea may have prevailed after 2003.

Due to concern over this, the Joint ICES/NAFO Working Group on Harp and Hooded Seals (WGHARP) recommended that removals be restricted to 30 062 animals in the White and Barents Sea in 2010. The Joint Norwegian-Russian Fisheries Commission followed this request and allocated 7 000 seals of this TAC to Norway. On this background, Russian sealing in 2010 was planned to be continued using the new boat-based approach introduced in the White Sea catch in 2008. This catch, using ice class vessels fitted with small catcher boats, would focus primarily on weaned pups (beaters), to a much less extent on adult seals. No white-coats would be taken. However, as was also the case in 2009, Russian authorities implemented a ban of all White Sea pup catches. Despite considerable effort from PINRO specialists to explain that a sustainable harvest from the population would be perfectly possible, the Russian authorities concluded that all pup catches in the White Sea should be banned in 2010. Due to this, there were no Russian harp seal catches in the White Sea in 2010, although a few animals were taken for scientific purposes. One Norwegian vessel had intended to conduct sealing operations in the southeastern Barents Sea in 2010. However, the operation ran into formal problems with the lack of necessary permissions from Russian authorities and had to be cancelled after only a few days of hunting – at this point the vessel had taken 150 1+ animals.

Norwegian and Russian catches in 2010, including catches under permits for scientific purposes, are summarized in the table below:

Area/species	**Norway**	**Russia**	**Sum**
GREENLAND SEA			
Harp seals			
Pups	2823	0	2823
Older seals (1yr+)	1855	0	1855
Sum	4678	0	4678
Hooded seals			
Pups	14	0	14
Older seals (1yr+)	164	0	164
Sum	178[1]	0	178
Area subtotal	4856	0	4856
BARENTS SEA / WHITE SEA			
Harp seals			
Pups	0	5	5
Older seals (1yr+)	150	5	155
Sum	150	10[1]	160
Area subtotal	150	10	160
TOTAL CATCHES	5006	10	5016

[1] Animals taken under permit for scientific purposes

2. EXCHANGE OF INFORMATION AND SUMMARY REPORTS OF RESEARCH ACTIVITIES IN 2010

2.1 Norwegian research

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

IMR conducted aerial surveys to assess pup production for populations of both hooded and harp seals in the Greenland Sea in 2007. The results are now published and implemented in the management of both species. Following the request from ICES concerning data rich populations (the most recent abundance estimate should be prepared from surveys and supporting data (e.g., birth and mortality estimates) that are no more than 5 years old), new surveys must be conducted in the Greenland Sea in 2012. Harp seals should be the prime target species since this population is still hunted. If possible, however, both species will be surveyed. Hooded seals have been protected since 2007 – to assess the effect of protection on the pup production, more than 5 years are needed due to the usually 4-5 years age at maturity observed in hooded seals.

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 and subsequent years) discoveries of breeding harp seals in areas outside those used historically by the species could both be indicative of such changes. 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 should be conducted. If new breeding patches are observed, this will have considerable implications for future research, management and hunting activities in the area.

2.1.2 Biological parameters

Biological parameters (fertility, mortality, demography) are important in the population models used to assess status and catch potential in harp and hooded seals. For data rich assessment, ICES require that such data are updated every 5 year. Most recent data for the Barents Sea/White Sea stock of harp seals is from 2006. For the Greenland Sea harp seal stock, new data were collected during the commercial hunt on the moulting grounds in 2009 on reproductive rates to supplement material collected in 2000-2008. ICES now consider both harp seal stocks to be data rich – to maintain this status, new data must be secured for the Barents Sea / White Sea stock in 2011.

In 2006, lower jaws (containing the teeth) and eyes were collected from harp seals in the southeastern Barents Sea for the purpose of comparing age estimates obtained by different methods, the traditional technique of counting growth layer groups (GLGs) in teeth and aspartic acid racemization (AAR) in eye lens nuclei. A significant correlation between age estimates obtained using the two approaches was found. Thus, AAR could prove to be useful, particularly for aging older animals in species such as harp seals where difficulties in counting GLGs tend to

increase with age.

2.1.3 Barents Sea harp seal body condition

In previous studies of Barents Sea harp seals, observations have indicated that poor condition of juvenile and adult seals could be linked to reduced recruitment to the stock. In a Norwegian sampling program conducted during April/May in 1992-2006 onboard Norwegian sealers operating in the southeastern Barents Sea (the East Ice), body condition data were collected from a large number of juvenile and adult harp seals. The data were analyzed to determine if there are some year-to-year variations, in particular if there are some changes after 2003 when the possible decline in recruitment to the stock could have occurred. For adult seals (1+ animals), a significant drop of body weight, condition index, and blubber thickness were observed in 2006 compared to previous years. Variation in abundance of several potential forage species have occurred in recent years. How these changes may have affected the general condition of harp seals in the area is not known. To address this question, new samples are required. Sampling from commercial catches in the southeastern Barents Sea in April-May 2011 is highly recommended.

2.1.4 Harp seal feeding during summer in the Barents Sea

During summer, very large numbers of seals were observed along the ice edge and 20-30 nautical miles south of this in the Barents Sea. Preliminary results from analyses of faeces and gastrointestinal tracts (collected in 1996, 1997 and 2004-2006) 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. To obtain a more integrated picture of the summer diet, the predator-prey relationship with respect to fatty acids was studied in 57 harp seals and 16 potential prey species collected simultaneously in the area in May-June 2006. The fatty acid composition was determined in the inner and outer sections of the seal blubber and in the whole, ground up bodies of the potential prey. The fatty acid composition differed substantially between potential prey species, and between the prey and the blubber. The fatty acid composition of the prey species which had been identified from stomach/intestine contents were more similar to the fatty acid composition in the blubber than the fatty acid composition of the prey not found in the stomach/intestines. The fatty acid composition of the outer layer was independent of the composition of the prey but dependent on the age of the seals. The weak predator-prey relationship, with respect to fatty acid composition in the inner blubber and the prey, suggests that the fatty acid composition in the inner layer is mainly predetermined by the metabolism rather than the fatty acid composition of the diet. Thus, using fatty acid composition as an estimator of prey use appears unreliable.

2.2 Russian research

2.2.1 Estimation of harp seal pup production in the White Sea

Pup production estimates based on data collected during traditional Russian multispectral aerial survey (infrared [IR] and digital RGB imageries) carried out between 20-23 March 2010 are now

available. Before, during and short time after the survey, traditional ice condition monitoring was carried out using all available internet sources including ENVISAT radar data, information of North Hydro Meteorological Centre from Archangelsk (NHMC) and Company ScanEX from Moscow. Under current observed and forecasted ice conditions, the pupping period was assumed to begin and finish later than in 2009 (Vladislav Svetochev, pers. comm.).

Prior to the multispectral survey, reconnaissance flights were conducted in the entire White Sea area on 8 and 14 March. During these flights, observations were made of ice condition, localization of main breeding patches, and the progress in breeding activity. Few active whelping (determined by the presence of blood on the floes) was observed on 8 March. Increasing numbers and area of blood spotted floes was observed on 14 March. Thus, it was assumed (based on analyzes of current observed and forecasted ice conditions, taking into account also information on ice drift (from NHMC) and above mentioned reconnaissance flights) that the starting date of the multispectral aerial survey (20 March) was convenient to get pup production numbers data near the peak of pupping.

The ice conditions in 2010 were considerably better for harp seal whelping than in 2008 and 2009, and closer to the situation observed in 2002-2003 when modern maximum of total pup production were recorded. The entire survey period was characterized with calm, stable winter weather which was very beneficial for the activities.

As traditionally in previous multispectral aerial surveys all track lines were flown along longitudes with a transect spacing of 7.5 km. It was started from the border between ice and open water (no ice) or coastal line and finished in border between ice and open water or in coastal line. The most considerable whelping patches were observed in areas where ice concentrations were between 70-90%. According to information from the NHMC, the ice drift was very slow and passive inside the White Sea, ice drift outside was very small and local. Direct satellite monitoring of ice drift was not conducted.

The highest pup production density was recorded in the south-eastern part of the “Basin” in the White Sea, close to the border with the Dvinsky Gulf. In other areas of the White Sea densities were similar or much lower, and in adjacent south-eastern areas of the Barents Sea (Cheshskaya Bay and outside it) only very scattered adults with pups were observed. The total pup production estimate is 163 022 (SE=32 342). This value is slightly higher than in 2009 and higher in 2005, 2008 but still less than observed in 2004 and in 2000-2003.

As in 2008-2009, walruses were observed in the harp seal whelping patches also in 2010, presumably feeding on pups. The icebreaker and vessels activity observed in the area in previous years which was considered to a potentially important source of mortality did not occur in 2010 as in 2009.The shipping route was changed as a result of efforts by PINRO, NHMC and the World Wildlife Fund so that ships passed to the south and around the harp seal whelping patches.

At the 2009 meeting the WGHARP suggested that the remaining possibilities to account for the reduced pup production since 2004 include reduced adult recruitment due to past juvenile mortality, unobserved mortality of adults in recent years, or a shift in contemporary pupping to areas outside of the traditional areas. Also, the WGHARP was informed that during the late 1980s or early 1990s, some reports of harp seal pups being observed in Svalbard were received.

Therefore, it appears very important that areas in the northern and south-eastern Barents Sea and also in the south-western Kara Sea be searched during future surveys.

2.2.2 Other issues

During late spring, summer and early autumn, several dedicated expeditions were carried out in the Kola Peninsula coastal zone, using small boats and vessels. In the Barents Sea open area oportunistic sighting surveys onboard research and fisheries vessels, including the annual joint Russian-Norwegian ecosystem surveys, were carried out. During all surveys mentioned above, data on marine mammal distribution and numbers were collected, taking into account also environmental conditions and fish species distributions and biomass. The main aim was to attempt to estimate marine mammals and fisheries interactions on one side, and influence of current climatic changes and human activity on marine mammals on the other.

2.3. Joint Norwegian-Russian work

2.3.1 Joint studies of life history parameters

To assess possible reasons for the apparent difficulties faced by the population of Greenland Sea hooded seals is a challenge. Historical Norwegian, Russian and Canadian data which describe the trends in fertility rate and maturity at average age (MAM) for hooded seals in the Greenland Sea as well as in the Northwest Atlantic have recently been subjected to joint analyses. For Northwest Atlantic hooded seals, estimates of mean age at primiparity (i.e., first birth) was observed to have increased from 4.2-4.5 years in 1956-78 to 6.1 years in 1989-95. Simultaneously, pregnancy rates showed a significant drop from 91-98 % in 1967-87 to 79-74% in 1989. Thus, not all mature hooded seal females produce offspring each year, and this seems to apply to all age groups. There is no evidence neither of absence nor reduction in the fertility of older females.

For the Greenland Sea stock of hooded seals, data on fertility rate and maturity are from 1956-1994. Updated information is, therefore, required. In 2007-2008, material for a broader project including both assessment of reproduction, contaminant loads and general health status of Greenland Sea hooded seals were collected from 85 animals. To supplement these samples, a dedicated survey was conducted in the Greenland Sea in July 2010. A total of 151 hooded seals were taken for scientific sampling during the cruise. All new material from Greenland Sea hooded seals will be analyzed and compared with available historical material in 2011.

Blind readings of known-age samples is the ultimate quality control method for age estimates based on hard tissues such as seal teeth. Based on a unique collection of known-age harp seal teeth (age range: 1-18 years), an evaluation of ageing errors in relation to reader experience, sex and tooth format (images versus originals) were performed in a joint experiment including a number of relevant laboratories (including, e.g., Canada, Norway and Russia). Image-based blind readings generally showed high accuracy and precision up about 8 years followed by increasingly negative bias and increased variance. Separate analyses were therefore conducted for young seals (1-7 years) and older seals. For young seals, moderate associations were found between experience ranks and levels of bias, precision and proportions of correct readings. For older seals,

only precision levels showed association with experience. Minor effects of sex and tooth format are not thought to affect these main patterns. Observed errors, even for highly experienced readers, may affect important age related parameters. This emphasizes the importance of known-age calibration of all readers.

2.3.2 Attempted tagging of harp seals in the Barents Sea

A high priority part of the planned Joint Research Program on Harp Seal Ecology is to deploy satellite transmitters on harp seals in the White Sea. In all the years 2007-2010 it was planned to do this in a joint Russian-Norwegian effort just after the moulting period (in late May), or, alternatively, in late March – early April if ice conditions turns out to be unfavorable in early May. Unfortunately, the Federal Technical Committee (FTC) has forbidden all satellite tagging using non-Russian tags in Russian waters in all years. Both parties strongly regret the decision made by the committee.

The Parties still agree that tagging seals in the White Sea is 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 be balanced. Therefore, PINRO will apply for permission to tag seals in the White Sea also in 2011. If permissions to tag are received, the Russian side (PINRO) is responsible for organizing the logistics required for a vessel-based live catch of seals in May 2011, while IMR is responsible for the satellite tags, including providing all necessary technical details, as well as for providing experienced personnel and equipment for anaesthetizing seals and tag deployment. The use of Russian tags will be considered if permission from FTC to use Norwegian tags is not received.

As an alternative to the White Sea operation, IMR conducted a boat based survey to the northwestern Barents Sea in the period 25 May – 12 June. The purpose of the cruise, which also included Russian participation, was to capture 15 harp seals alive, deploy satellite tags on them, and release them. However, it proved impossible to capture any seals in the planned area during the available period. Only few harp seals were observed. Also, very little ice was observed in the area in the period, and the available drift ice was much to spread out and thin to allow for the planned live capture of seals on the pans. The lack of proper ice has most probably contributed to the very low number of seals observed in the area. Nevertheless, IMR will apply for a new survey to the Hopen area in May/June 2011 in case permission to tag seals in the White Sea is not obtained.

3. STATUS OF STOCKS AND MANAGEMENT ADVICE FOR 2011

The WGHARP met at the Institute of Marine Research, Tromsø, Norway, 27-30 August 2008, to assess the stocks of Greenland Sea hooded seals, whereas harp seals in the White Sea and Greenland Sea were last assessed at a WGHARP meeting at the ICES HQ in Copenhagen, Denmark, 24-27August 2009. The advice given by ICES in 2008, based on the 2008 WGHARP meeting, and the 2009 assessments of the harp seal stocks by WGHARP, were used by this Working Group on Seals to establish management advice for 2011 to the Joint Norwegian-Russian Fisheries Commission.

Management agencies have requested advice on "sustainable" yields for these stocks. ICES note that the use of "sustainable" in this context means the catch that is risk neutral with regard to maintaining the seal population at its current size within the next 10 year period. The ICES management of harp and hooded seals require that the populations in question are defined as "data rich". Data rich stocks should have data available for estimating abundance where a time series of at least three 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".

Population assessments were based on a population model that 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 modelled estimates can be projected into the future to provide a future population size for which statistical uncertainty is provided for various sets of catch options. In case of data poor populations, catch limits are estimated using the more conservative Potential Biological Removal (PBR) approach. 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.

3.1. Greenland Sea

The Working Group **recommends** the opening dates for the 2011 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 agree that the ban on killing adult females in the breeding lairs should be maintained in 2011.

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 (16 140 pups, CV = 0.13) 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 current total population estimate of 82 380 (95% C.I. 65 180-99 580) animals.

Catch estimation: ICES still regard the Greenland Sea stock of hooded seals as data poor. For this reason, the PBR approach was used to calculate catch limits. The level identified was 2 200 animals. However, ICES concludes that even harvesting at this low 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 (2008) and WGHARP (2009) that the 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	0.104
1984	103,250	0.147
1985	111,084	0.199
1987	49,970	0.076
1988	58,697	0.184
1989	110,614	0.077
1990	55,625	0.077
1991	67,271	0.082
2002	98,500	0.179
2007	110,530	0.250

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 a total population size for Greenland Sea harp seals in 2009 of 810 600 (95% C.I. 487 100-1 134 000) animals.

Catch estimation: ICES consider this population to be data rich, and the usual population model was used to provide catch options. Current catch level will likely result in an increase in population size of 44% over the 10 years period 2009-2019, whereas a catch of 30 865 1+ animals, or an equivalent number of pups (where one 1+ seal is balanced by 2 pups), per year would sustain the population at present level over the same period.

Since Greenland Sea harp seals are classified as data rich, ICES now find the Precautionary Approach framework developed for the management of harp and hooded seals appropriate for this particular population, given that the reference levels reflect the most recent estimate of total population size. ICES suggest that when the population is between N_{70} (i.e., 70% of current level) and N_{max}, (current level) harvest levels may be decided that may stabilise, reduce or increase the population, so long as the population remains above the N_{70} level. A preferred option is to design the TAC to satisfy specific risk criterion (e.g., 80% probability of remaining above N_{70} over a 10 year period). Using this approach, a modelled catch level of 42 400 1+ animals, or an equivalent number of pups (where one 1+ seal is balanced by 2 pups), in 2010 and subsequent years is obtained. 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.

The Working Group recommend that the advice from ICES 2008 and conclusions from WGHARP 2009 be used as a basis for the determination of a TAC for harp seals in the Greenland Sea in 2011:

- *If the management objective is to maintain the population at current level, a TAC of 30 865 1+ animals or an equivalent number of pups, is recommended.*
- *If the management objective is to reduce the population towards N_{70} over a 10-year period, a TAC of 42 400 1+ animals, or an equivalent number of pups, is recommended.*

In both harvest scenarios, one 1+ seal should be balanced by 2 pups.

3.2 The Barents Sea / White Sea

Current Russian regulations allows for seal hunting in the White Sea and southeastern Barents Sea from 20 March to 1 May. Both Parties **recommends** an extension of the hunting season which should include the entire period from 20 March to 15 May for the whole area. Exceptions from opening and closing dates should be made, if necessary, for scientific purposes.

The Working Group agreed that the ban on killing adult harp seal females in the breeding lairs should be maintained in 2011.

3.2.1. Harp seal.

Russian aerial surveys of White Sea harp seal pups were conducted March 2004, 2005, 2008, 2009 and 2010 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	.150
2000	322,474	.098
	339,710	.105
2002	330,000	.103

2003	327,000	.125
2004	231,811 234,000	.190 .205
2005	122,400	.162
2008	123,104	.199
2009	157.000	.108
2010	163,032	.198

As a result of the 2009 survey, regarded to be very good by WGHARP, and the 2010 survey (not yet evaluated by WGHARP), the Working Group feel that the reduced pup production observed since 2004 does not appear to be a result of poor survey timing, poor counting of imagery or the disappearance of pups from the survey areas prior to the survey. The remaining possibilities to account for the reduced pup production since 2004 include reduced adult recruitment due to past juvenile mortality, unobserved mortality of adults in recent years, or a shift in contemporary pupping to areas outside of the traditional areas. Therefore, the Working Group concludes that it is important that areas in the northern and southeastern Barents Sea and Kara Sea (south-western part) be searched during future surveys.

The population model usually applied by ICES was 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 1,099,000 was obtained. Given this size, WGHARP consider that the White Sea / Barents Sea harp seal stock is currently at a level which is somewhere between N_{30} and N_{50} .

Catch estimation: Even though WGHARP now consider the population data rich, the fit of the available population model for White Sea/Barents Sea harp seal population was too poor to allow the impact of catch options to be reliably assessed. For this reason, WGHARP concluded that the only available alternative was to provide sustainable catch limits based upon the PBR approach. Using this approach, the level of sustainable removal would be 30,062 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.
As suggested by WGHARP, the Working Group recommend that the PBR level (30, 062) be used as a basis for the determination of a TAC for harp seals in the White Sea / Barents Sea in 2011.

3.2.2 Other species

The Working Group agreed that commercial hunt of bearded seals should be banned in 2011, as in previous years, but it **recommend** to start catch under permit for scientific purposes to investigate results of long time protection.

4. RESEARCH PROGRAM FOR 2011+

4.1. Norwegian investigations

4.1.1 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. To meet the ICES request of data-richness, new surveys are planned in 2012. Harp seals will be the prime target species – if possible, also hooded seals will be surveyed. Planned cooperation with Canada and Russia may secure that all North Atlantic stocks are surveyed simultaneously. Preparations begin in 2011.

4.1.2 Studies of life history parameters

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 in the southeastern Barents Sea in April/May in 2011.

4.1.3 Seal physiology and tagging

On research cruises to the Greenland Sea in March/April 2011, 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.

4.1.4 Harp seals taken as by-catches in gill nets

Provided harp seals invade the coast of North Norway also during winter in 2011, biological samples will be secured from animals taken as bycatches in Norwegian gill net fisheries.

4.2.Russian investigations

4.2.1 The White Sea/Barents Sea harp seal population pup production numbers

Plans are to continue annual multispectral aerial survey with the purpose to use these data for determination of harp seal population size by modelling. This information is very important for the Joint Norwegian-Russian Research Program on Harp Seal Ecology. This research will be carried out under recommendations from WGHARP 2009 and the JRNFC 39th Session.

4.2.2 The White Sea/Barents Sea harp seal population biology

Research on harp seal reproductive biology is planned to be carried out in the White and the Barents Seas. The aim is to study harp seal biological data such as mortality, maturity, birth rate, and morphological and physiological indexes. During spring, work will be continued on pup mortality estimation in the White Sea. Plans include also continuation of research on harp seal feeding in the White and the Barents Sea during spring and summer. All these research activities will be carried out under the Harp Sea Ecology Programme and recommendations from WGHARP 2009 and JRNFC 39th Session.

4.2.3 Marine mammal species distribution and numbers

In 2011 annual research of marine mammals distribution and numbers in dedicated special survey as well in the coastal zones as in the open area of the Barents Sea will be continued. The main purpose these surveys are study of marine mammals role in the Barents Sea ecosystem including influence to fisheries as top predators.

4.3. Joint Norwegian - Russian investigations

4.3.1 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 in 2007-2010. However, the Federal Technical Committee has forbidden all satellite tagging in Russian waters in all years. Both parties strongly regret the decision made by the committee.

New attempts will be made to tag seals in the White Sea in 2011. As in previous years, IMR will apply for a survey to the Hopen area in May/June 2011 in case permission to tag seals in the White Sea is not obtained. The duration of the program will be 2011-2014.

4.3.2 Life history parameters in seals

Russian scientists have participated in scientific work on Norwegian sealers during March-May both in the southeastern part of the Barents Sea and in the Greenland Sea. This type of Norwegian-Russian research cooperation is encouraged also in the future. This would enable coordinated and joint sampling of new biological material. If Russia can realize scientific or commercial vessel trips in the White, Barents and Greenland Seas, invitation for participation of Norwegian scientists is desirable.

Available, new material from Greenland Sea hooded seals (collected in 2007-2010) will be analyzed and com pared with historical data (1956-1994) in 2011.

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

Substantial changes in extent and concentration of drift ice in the Greenland Sea may have triggered behavioral changes of such a magnitude as a relocation of breeding for at least parts of the seal populations. The Working Group **recommends** that this is further examined by using aerial surveys.

4.3.4 Reconnaissance of possible new harp seal breeding patches outside the White Sea

Possibilities to account for the reduced harp seal pup production in the White Sea since 2004 include a shift in contemporary pupping to areas outside of the traditional areas. During the late 1980s or early 1990s, some reports of harp seal pups being observed in Svalbard were received. Therefore, the Working Group conclude that it is important that areas in the northern and southeastern Barents Sea and Kara Sea (south western part) be searched during future aerial reconnaissance surveys.

4.3.5 Population model improvements

The current population model used for northeast Atlantic seal stocks applies a constant reproductive rate for all years. Given the changes in reproductive rates observed for the populations, ICES recommends that the model be modified to allow for changes in reproductive rates over time. The impact of the selection of priors and associate variance should also be explored further. This work started in 2010, and will continue in 2011 in close cooperation with Canadian scientists.

4.3.5 Comparison of methods used in pup production estimation

The Parties plan to continue work on comparison of methods used in pup production estimation, including both reading of images and subsequent calculations of the aerial survey data. This will continue the successful work started in 2009, and should include participation from Canada and Greenland.

4.4. 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 2011:

Area/species/category	Russia	Norway

Barents Sea / White Sea		
Whelping grounds		
Adult breeding harp seal females	200	0
Harp seal pups	100	0
Outside breeding period		
Harp seals of any age and sex	520	300
Greenland Sea*		
Whelping grounds		
Adult breeding harp seal females	0	0
Harp seal pups	0	0
Adult breeding hooded seal females	0	50
Hooded seal pups	0	50
Outside breeding grounds		
Harp seals of any age and sex	0	100
Hooded seals of any age and sex	0	0

5. OTHER ISSUES

5.1 Bans on seal hunting and products

From a scientific point of view there is no doubt that harp and hooded seal stocks in the North Atlantic are well managed and sustainably harvested with acceptable hunting methods. This is acknowledged both by ICES and NAMMCO. For this reason the Working Group regrets the decision by Russian authorities to implement a ban on all hunting of weaned harp seal pups in the White Sea in 2009 and 2010. Also, the Working Group strongly regrets the recent political and emotion-driven ban on all import of seal products in EU. As also concluded by NAMMCO, this is a non-scientific step backwards in relation to requested ecosystem based management of all marine resources, seals included. Excluding the possibilities to harvest at all levels in the ecosystem may in the long run have implications for harvest possibilities at other levels than those decided to be excluded. If the subsequent results are reduced harvest possibilities for some species, the Working Group suggest that it be discussed whether the costs of such reductions should be covered by EU itself (e.g., by quota reductions) since this organization implemented the ban.

5.2 Observations of marine mammals on the ecosystem surveys

Marine mammal observers have participated since 2003 in the ecosystem survey in the Barents Sea in August-September. Data from the ecosystem survey has provided significant insight into

baleen whale and dolphin distributions in the Barents Sea, and the processes influencing their distributions, such as marine mammal-prey interactions, interspecific competition and selective habitat use. Knowledge of these processes is required for understanding the ecological role of marine mammals, as well as for evaluating the assessment methods currently used. Furthermore, the marine mammal distributions have been monitored through years with low and increasing capelin abundance. We will, if getting a good observer coverage in 2010 and 2011, be in a unique position to investigate how fluctuations in capelin abundance influence capelin-marine mammal interactions, as well as interactions between marine mammals and alternative prey species. The Parties agreed that the aerial surveys, carried out supplementary to the vessel based surveys (as was done in 2003-2005), provide valuable information if covering areas north and east of the areas covered by the vessels. These areas are particularly important for identifying the distribution of harp seals, which is not observed within the areas surveyed by the vessels. For this reason, the Working Group recommends to continue aerial surveys as part of the ecosystem surveys in 2011 and later.

5.3 Joint research program on grey seals

Grey seals are hunted in Norway. To set quotas, grey seal abundance is estimated approximately every 5 year. The method of abundance estimation is based on total counts of the pup production – the total population is subsequently estimated by modelling. Last time grey seal pup production surveys aimed to cover all the breeding colonies along the entire Norwegian coast were conducted, was in 2006-2008. Boat based as well as aerial surveys were applied.

There are large breeding colonies of grey seals located on the Murman Coast in Russia. Previous tagging experiments have shown that there is exchange of seals between these colonies and feeding areas in North Norway. Abundance estimation, using pup counts, in the Russian colonies has not been performed since 1991. For this reason, both Parties **recommend** that the Russian grey seal breeding colonies at the Murman Coast should be covered again. The Ainov islands were partly surveyed in 2006. The Parties recommend that these surveys are completed, and that also the Seven Islands should be surveyed as soon as possible. Ideally each colony should be visited three times (minimum twice) during the breeding period. The Parties discussed possibilities of multispectral surveys carried out by PINRO using a smaller aircraft. Norwegian participation in the grey seal surveys in Russia is highly recommended by both Parties. Traditionally the Russian grey seal colonies have been surveyed by Murmansk Marine Biological Institute (MMBI), and continued cooperation with MMBI is encouraged.

The parties agreed that this task can be most effectively solved within the frames of a future joint research program, preferably developed within the frames of the JRNFC. In addition to abundance estimation, also other important issues should be addressed:

- Stock identity: Do the Murman Coast grey seal colonies constitute isolated stocks, or are they part of the stock distributed in North Norway north of Vesterålen? This question can be addressed using genetic analyses.
- Spatial distribution and habitat use, e.g., what are the feeding areas for the Russian grey seals? Could be addressed by using satellite tags.
- Feeding habits and conflicts with fisheries and fish farming (diet studies).

6. APPROVAL OF REPORT

The English version of the Working Group report was approved by the members on 6 October 2010.