Appendix 8

The 45th Session of the Joint Norwegian - Russian Fisheries Commission, Astrakhan, Russia, 5-9 October 2015

REPORT OF THE WORKING GROUP ON SEALS

Participants:

RUSSIA

V. B. ZABAVNIKOV	PINRO, Murmansk

NORWAY

T. HAUG	Institute of Marine Research, Tromsø
J.E. JOHNSEN	Norwegian Fisherman's Association, Trondheim
A. PEDERSEN	Norwegian Coastal Fishermens Union, Lofoten
R.J. PISANI	Interpreter

Contents:

1. EXCHANGE OF INFORMATION AND SUMMARY OF SEAL CATCHES IN 2015

Norwegian catches in the Greenland Sea (West Ice) in 2015 was taken by 1 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 2015. Only a few animals (11, whereof 5 were pups) was taken for scientific purposes. The 2015

TAC for harp seals in the Greenland Sea was set at 21 270 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. Total catches in 2015 were 2,237 (including 2,144 pups) harp seals, representing only 8% of the identified sustainable levels.

A possible reduction in harp seal pup production in the White Sea may have prevailed after 2003. Due to concern over this, ICES recommended that removals be restricted to the estimated sustainable equilibrium level of 17,400 1+ animals (where 2 pups balance one 1+ animal) in the White and Barents Sea in 2015. The Joint Norwegian-Russian Fisheries Commission has followed this request and allocated 7,000 seals of this TAC to Norway. A ban implemented on all pup catches prevented Russian hunt in the White Sea during the period 2009-2014. This ban was removed before the 2015 season. Unfortunately, however, the availability of ice was too restricted to permit sealing, resulting in no commercial Russian harp seal catches in the White Sea in 2015. Also, no Norwegian vessels aimed for the hunting area in the southeastern Barents Sea (the East Ice) in 2015.

Norwegian and Russian catches in 2015, including catches under permits for scientific purposes, are summarized in the table below:

Area/species	**Norway**	**Russia**	**Sum**
GREENLAND SEA			
Harp seals			
Pups	2144	0	2144
Older seals (1yr+)	93	0	93
Sum	2237	0	2237
Hooded seals			
Pups	5	0	5
Older seals (1yr+)	6	0	0
Sum	11[1]	0	11
Area subtotal	2248	0	2248
BARENTS SEA / WHITE SEA			
Harp seals			
Pups	0	0	0
Older seals (1yr+)	0	0	0
Sum	0	0	0
Area subtotal	0	0	0
TOTAL CATCHES	2248	0	2248

[1] Taken under permit for scientific purposes

2. EXCHANGE OF INFORMATION AND SUMMARY REPORTS OF RESEARCH ACTIVITIES IN 2015

2.1 Norwegian research

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

The use of traditional photo aircrafts to assess seal populations in remote areas, such as the West Ice, is expensive, and has also become more difficult to operate during recent years. Few airports are available in the area: Constable Point in East Greenland, Akureyri in Iceland and one primitive landing stripe on the island Jan Mayen. The latter is not even always available. The Greenland airport is the main base – due to the ice conditions this arrangement requires that fuel for the operation is shipped to Constable Point the autumn before the surveys are carried out. With funding from the Norwegian Research Council (NRC), IMR has now started experiments with alternative (and cheaper) methods to perform photobased aerial surveys of seals in the West Ice. Two research survey have been carried out to the West Ice, the first in March 2014 using KV *Svalbard*, the second in March 2015 using MS *Bjørkhaug*. The aim of the surveys was to test the usefulness of UAVs (Unmanned Aerial Vehicles), operated by the Northern Research Institute (Norut), to perform aerial photographic surveys of harp and hooded seal whelping patches on the drift ice. Two drones were tested: One small (wingspan 2.10 m) with electromotor and one larger (wingspan 3.80 m) petrol-driven UAV. Digital cameras were used, and the largest UAV was also instrumented with thermal infrared (IR) camera. Both aircrafts were launched by a mechanical launcher from the ship deck. The smaller UAV could be landed on KV Svalbard's helicopter platform, while the larger had to be landed on ice floes, preferably at least 80 m long and 20 m wide. Both UAVs fly along predefined transects and altitudes, but changes can be implemented throughout the flight using satellite based communication. The UAVs are landed manually. The main aim of the investigations in 2014 was to explore various survey altitudes and camera settings to obtain an optimal altitude and camera set up for photographing seal pups. Simultaneous use of digital and IR cameras enabled exploration of combinations of those to detect and classify seals. Experience obtained from using the UAVs, and the quality of the images taken, were promising. Both harp and hooded seals, including pups, were easily identified on the images taken at an altitude of 300 m (the usual altitude for photographing during traditional surveys). Images from the IR camera did not improve the photo analyses. In 2015, we aimed also to test UV-cameras. Unfortunately, however, the largest UAV (including the equipment) was lost due to technical problems.

The experience obtained during the two surveys show that it is necessary to develop a system that enables us to land a relative large UAV on the helicopter platform. The ice conditions in the West Ice seal whelping patches usually implies small and uneven ice floes which make it difficult to land the UAV. It is important to improve the range of the largest UAV. Also, technical improvements on the UAV and equipment are necessary in order to be able to operate in cold and windy conditions.

In other seal whelping areas, such as the White Sea in Russia, UAVs could most probably be used very efficiently to perform photo surveys to estimate pup production. The ice conditions in the

White Sea, with large areas of very large ice floes will be perfect “landing stripes” for UAVs. Due to relative short distances to the seal whelping patches also land based UAV operations could probably be developed.

Manual analysis of images obtained in aerial photographic surveys is extremely time consuming and costly, and involves subjective human interpretation by trained experts. For this reason, the UAV project, also aims at developing methodology for automating the process of counting seals from aerial images. This will be achieved through the development of new image analysis and pattern recognition techniques tailored to detect seals in digital color images. This part of the work occurs in close cooperation with the Norwegian Computing Center, Oslo.

2.1.2 New population model for harp seals

The population model used in current management of the Barents Sea / White Sea harp seal populations is a deterministic age-structured population dynamics model. Available fecundity data are included in the model as a known quantity and no uncertainty around the measurements has been accounted for. The scarce available data on fecundity makes the model stiff and unable to fit to variations in the observed data, and the resulting confidence intervals are likely to be underestimated. Norwegian scientists have suggested an improvement to the population model to make it more flexible in capturing the dynamics of the observed pup production data. They accounted for the temporal variation in fecundity using a state-space approach, and assumed the fecundity to be a stochastic process that was integrated with the age-structured population dynamics of the current management model. Due to the limited availability of fecundity data for the Barents Sea / White Sea population, fecundity information from the Northwest Atlantic harp seal population was used. Summary statistics for the Northwest Atlantic time-series, such as autocorrelation and variance in fecundity, were used as prior distributions in the state-space model. The state-space model was more flexible than the deterministic model and provided a tight fit to the survey pup production estimates as it captured the sudden drop in the survey estimates from 2004 and 2005. The state-space model provided a higher estimate of current population size but also a much higher associated uncertainty. The current management model predicted that the pup abundance will have a slight increase over the next 15 years, whereas the state-space model predicted that the pup abundance will increase substantially. The state-space model show some promising results and might be a step forward towards more realistic modelling of the population dynamics of the Barents Sea/White Sea harp seal population.

2.1.3 Harp and hooded seal feeding habits in the West Ice

Harp and hooded seal diet data (contents from gastrointestinal tracts and faeces) have been collected by IMR during summer in 2008 and 2010 along the ice edge east of Greenland between 71°N and 79°N. The observed diet varied considerably between the two species. Polar cod dominated the hooded seal diet which also included squid and some other fish species. For harp seals, the diet was particularly characterized by the pelagic amphipod *Themisto* sp. In addition the harp seals had taken some krill and polar cod. Squid contributed much less to the hooded seal diet in this study than in previous studies in the same area. The results are now being published.

2.2 Russian research

2.2.1 Estimation of harp seal pup production in the White Sea

As in 2014, traditional Russian multispectral aerial research of pup production in the White Sea was not carried out in 2015 (last survey was in 20135). However, PINRO specialists carried out monitoring of ice conditions in the White Sea and in the Barents Sea adjacent area. Information from such research is of crucial importance for the estimation of harp seal pup production in the White Sea, and PINRO organize and carry out ice monitoring of the area using all accessible information. Satellite based information were obtained from Internet and the Northern Hydrometeorological Center (NHMC, Arkhangelsk). Below are thre examples, all describing the situation on 13 March which is considered to be the meantime for harp seal pupping in the White Sea.

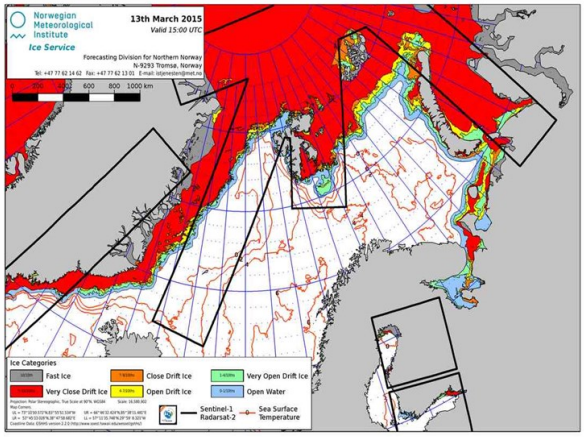

Figure 1. Example of ice conditions map from the Norwegian Meteorological Centre.

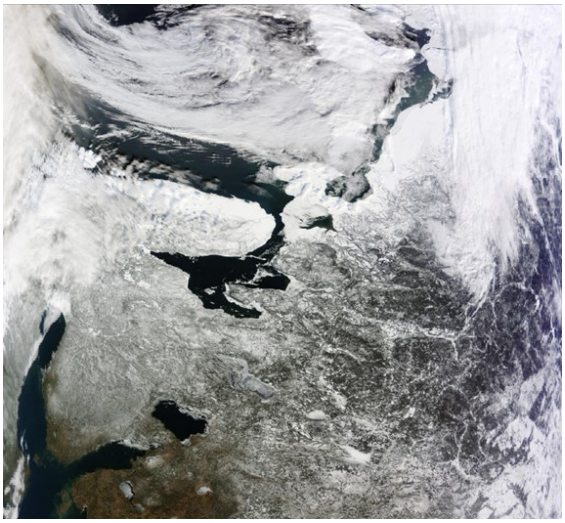

Figure 2. Example of ice conditions on satellite image from Terra/MODIS, NOAA, USA.

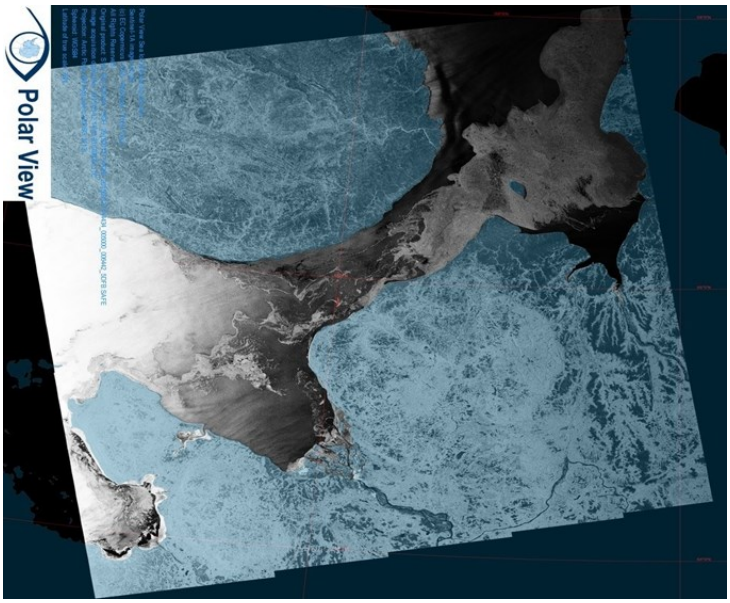

Figure 3. Example of ice conditions on satellite image from NHMC.

Figs 1-3 show that the ice conditions in areas where pupping traditionally occurs in the White Sea are very poor. This may suggest large pup mortality, or harp seal females may have changed area for safer pupping. Analyzes of the situation continues.

2.2.2 Other issues

During late spring, summer and early autumn in 2015, several dedicated expeditions were carried out in the Kola Peninsula coastal zone in the Barents Sea area, using small boats and vessels. In the Barents Sea open area, opportunistic sighting surveys onboard research and fisheries vessels, including the annual joint Russian-Norwegian ecosystem surveys, were carried out. During all surveys mentioned, 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. Research on mathematical modeling designed to estimate the total White Sea/Barents Sea harp seal population stock abundance and develop recommendations concerning harvesting strategy were continued.

2.3. Joint Norwegian-Russian work

2.3.1 Joint studies of life history parameters

Joint analyses of Norwegian and Russian data on female hooded seal reproductive biology in the Greenland Sea are under completion for publication. Ovary data collected in breeding patches from 1958 to 1999 show an estimated age at first birth of about 5 years up to 1980, and a slight increase to 5.5 years for the rest of the period. This is significantly higher than the minimum age at first birth in hooded seals of 4 years estimated for ovary data collected in breeding patches near Newfoundland during the period 1967-1973. This suggests that female Greenland Sea hooded

seals may have been resource limited throughout the study period and that the modeled population reduction up to 1980 has not resulted in increased per capita resource availability. This was a period of dramatic increases in commercial fisheries landings of many species known to be preyed upon by hooded seals, e.g., Greenland halibut, redfish and capelin. Even if some of these fisheries may have been sustainable from a fisheries point of view, reductions in standing stock may still have reduced the availability of many fish species to their natural predators.

Changes in ice conditions may also affect the energy balance of ice associated seals. There is, however, not much evidence of systematic changes in ice conditions in the Greenland Sea area in the first part of the study period up to 1980. After that the ice extent has steadily declined and the availability of perennial ice, preferred by hooded seals, has been strongly reduced. Ovarian data collected in the moulting lairs of Greenland Sea hooded seals in the early 1990s and in 2008-2010 show a mean age at first birth of about 5.5 years and thus do not suggest any major changes in habitat quality for hooded seals in the latter part of the study period. However, both Russian and Norwegian moulting lair data from 1990 show a considerably lower estimate of mean age at first birth than subsequent samples from 1991, 1992, 1994 and 2008-10. In contrast, the breeding patch data show great interannual consistency. Some hooded seals tagged in the Northwest Atlantic were recaptured close to the Greenland Sea moulting lairs in the early 1990s. It therefore cannot be excluded that influx of Northwest Atlantic hooded seals may sometimes affect results based on moulting patch material.

3. STATUS OF STOCKS AND MANAGEMENT ADVICE FOR 2016

The ICES Working Group of Harp and Hooded Seals (WGHARP) met during 26-30 August 2013 at PINRO, Murmansk, Russia, to assess the status and harvest potential of stocks of Greenland Sea harp and hooded seals and harp seals in the White Sea. Since a new abundance estimate for harp seals in the White Sea, based on Russian aerial surveys in 2013, became available in 2014, the group met again during 17-21 November 2014 in Quebec City, Quebec, Canada, to finish the assessment of this particular stock. The advice given by ICES in September 2013, based on the 2013 WGHARP meeting, and the additional information given by WGHARP in 2014, were used by this Working Group on Seals to establish management advice for 2016 to the JNRFC.

The basis for the advice was a request from Norway in September 2012 where ICES was requested to assess the status and harvest potential of harp seal stocks in the Greenland Sea and White Sea/Barents Sea and of the hooded seal stocks in the Greenland Sea, and to assess the impact on the harp seal stocks in the Greenland Sea and the White Sea/Barents Sea of an annual harvest of: 1) Current harvest levels; 2) Sustainable catches (defined as the fixed annual catches that stabilizes the future 1+ population); 3) Catches that would reduce the population over a 10-year period in such a manner that it would remain above a level of 70% of current level with 80% probability.

ICES have developed a Precautionary harvest strategy for the management of harp and hooded seals. The strategy includes two precautionary and one conservation (limit) reference levels. The reference levels relate to the pristine population size, which is the population that would be

present on average in the absence of exploitation, or a proxy of the pristine population (which in practical terms is referred to as the 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. The first precautionary reference level is established at 70% (N_{70}) of N_{max}.When the population is between N_{70} and N_{max}, harvest levels may be decided that stabilise, reduce or increase the population, so long as the population remains above the N_{70} level. ICES has suggested that this could be done by designing the TAC to satisfy a specific risk criterion which implicate 80% probability of remaining above N_{70} over a 10-year period (extended to a 15-year period by WGHARP in 2014). 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 (set by ICES at 30% (N_{30}) of N_{max}) is the ultimate limit point at which all harvest must be stopped.

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. Stocks whose abundance estimates do not meet all these criteria are considered “data poor”, and should be managed more conservatively.

Population assessments were based on a population model that estimates the current total population size, incorporating historical catch data, estimates of pup production and historical values of reproductive rates. The modelled abundance is 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.

3.1. Greenland Sea

The Working Group **recommends** the opening dates for the 2016 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 2016.

3.1.1 Hooded seals

Results from the most recent (2012) pup survey suggest that current pup production remains very low, and lower than observed in comparable surveys in 1997, 2005 and 2007. Due to some uncertainty regarding the historical data on pregnancy rates, the population model was run for a range of pregnancy rates (assuming that 50%, 70% or 90% of the mature females produced

offspring, respectively). All model runs indicated a population currently well below N30 (30% of largest observed population size). Recent analyses have indicated that pregnancy rates have remained rather constant around 70% in the period 1958 – 1999. Using this scenario, the model estimates a 2013 total population of 82 830 (95% C.I. 67 104 – 98 573).

Catch estimation: Following the Precautionary harvest strategy and the fact that the population is below N_{lim} , ICES recommend that no harvest be allowed for Greenland Sea hooded seals at this time.

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 assessment model trajectory suggests an increase in the Greenland Sea harp seal population abundance from the 1970s to the present (2013) abundance of 627 410 (95% C.I. 470 540 – 784 280) animals.

Catch estimation: ICES consider this population to be data rich, and above the N_{70} level (i.e., more than 70% of known maximum abundance measured). Thus, it is appropriate to provide catch advice using the assessment model and to apply the Precautionary harvest strategy. Current catch level will likely result in an increase in population size of 21% over the 10 years period 2013-2023, whereas a catch of 14 600 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.

Catches that would reduce the population over a 10-year period in such a manner that it would remain above a level of 70% of current level with 80% probability are 21 270 1+ animals, or an equivalent number of pups (where one 1+ seal is balanced by 2 pups), in 2014 and subsequent years. 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 be used as a basis for the determination of a TAC for harp seals in the Greenland Sea in 2016:

- *If the management objective is to maintain the population at current level, a TAC of 14 600 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 21 270 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 2016.

3.2.1. Harp seals

Russian aerial surveys of White Sea harp seal pups were conducted March 2004, 2005, 2008, 2009, 2010 and 2013 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	.190
	234 000	.205
2005	122 400	.162
2008	123 104	.199
2009	157 000	.108
2010	163 032	.198
2013	128.032	.237

As a result of the 2009 and 2010 surveys, regarded to be good 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, disappearance/mortality of pups prior to the survey or increased adult mortality. According to WGHARP, the most likely explanation for the change in pup production seems to be a decline in the reproductive state of females.

The population assessment model used for the White Sea/Barents Sea harp seal population provided a poor fit to the pup production survey data. Nevertheless, ICES has decided to continue to use the model which estimated a total 2015 abundance of 1 368 200 (95% C.I. 1 266 300 – 1 509 378). The modelled total population indicates that the abundance decreased from 1946 to the early 1960s, but has generally increased since then.

Catch estimation: Based on current data availability, the Barents Sea / White Sea harp seal population is considered to be "data poor". The equilibrium catch level is 19 200 1+ animals, or an equivalent number of pups (where one 1+ seal is balanced by 2 pups), in 2015 and subsequent years. The PBR removals are estimated to be 33 500 (14% pups) seals. This catch option indicates a 23% reduction of the 1+ population over the next 15 year period.

Despite the fact that this population is now classified as data poor, ICES expressed concerns over the high removals and declining population resulting from the PBR estimations, and concluded that the estimated equilibrium catches were the most preferred option.

The Working Group suggest that the advice from ICES be used as a basis for the determination of a TAC for harp seals in the White Sea / Barents Sea in 2016: A TAC of 19 200 1+ animals, or an equivalent number of pups (where one 1+ seal should be balanced by 2 pups), is recommended.

3.2.2 Other species

The Working Group agreed that commercial hunt of bearded seals should be banned in 2016, 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 2016+

4.1. Norwegian investigations

Secure that the stocks remain data rich:

- Analyze new (from 2014) data on fertility and condition for harp seals in the West Ice
- Collect new data on biological parameters for harp seals in the East Ice as soon as possible

Killing methods in Norwegian commercial sealing

- Analyze collected data on hunting methods (from 2013 and 2014), supplement with additional data from the 2016 hunt if possible

Focus on the difficult sock situation for hooded seals:

- Analyzes of collected biological material from the West Ice

Analyses of historical data from harp seals

- Applies to the East Ice: biological parameters and trophic level

Seal diets

- Publication of new data from the West Ice (harp and hooded seals, gastrointestinal tract contents and faeces).
- Analyzes of stable isotopes and fatty acids from harp seals and their prey in the Barents Sea

Tagging with satellite based tags, harp seals in the White Sea

- Maybe we finally can do this in 2016

Observations of marine mammals on the ecosystem surveys

- Continues in 2016 - the survey will be extended to include also the polar ocean

4.2.Russian investigations

If possible in 2016, Russia plans to carry out multispectral aerial surveys of harp seals of the White Sea/Barents Sea population on their traditional whelping patches in the White Sea as well as in non-traditional areas in the northern and south-eastern parts of the Barents Sea using a specially equipped Russian aircraft (called Research aircraft – RA) . Standard multispectral methods will be applied. Besides and also if possible, complex dedicated aerial surveys are planned to study other marine mammal species distribution and numbers, and also information about environmental conditions and the distribution of fish species and other marine organisms. During the annual ecosystem surveys in the Barents and Norwegian Seas, sightings will be recorded of marine mammals from the research vessels and, if possible, from RA. Scientific observers will collect data on marine mammal distribution on board commercial vessels. Traditional annual coastal and boat surveys with the purpose to observe marine mammal species and to collect biological material will be carried out. Sampling of biological material will occur during the commercial harp seal catch.

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 2007-2012. However, this

proved impossible due to some limitations regarding deployment of telemetric tags in all years. Later, in 2013-2015, these limitations were removed, but lack of funding hampered the tagging of seals this year. In 2016 IMR is attempting to obtain funding (from the Norwegian Research Council) to carry out satellite tagging in the White Sea. During the planned tagging experiment, PINRO will provide the necessary logistics required for helicopter- or boat-based live catch of seals in April-May 2016. IMR will, as before, be 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. All data obtained from the tags will be available for both PINRO and IMR scientists. Both US and Russian transmitters can be used. The transmitters cannot collect geographically positioned temperature and salinity data.

After the 2016 tagging season future seal tagging will be decided upon following an evaluation of both the tagging methods and the obtained seal movement data set. Due to low pregnancy rates and decline in pup production it will be important to focus on harp seal ecology and demographics in the coming years.

4.3.2 Other issues

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.

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.

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.

Population model improvements

Work with improvements of the population model used for northeast Atlantic seal stocks, incorporating variable reproductive parameters and, if possible, also observed ecological variations, continues. This work occurs in close cooperation with Canadian scientists, but also other relevant institutions (e.g., SMRU in St. Andrews) may be included.

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 2016:

Area/species/category	Russia	Norway
Barents Sea / White Sea		
Whelping grounds		
Adult breeding harp seal females	170	0
Harp seal pups	30	0
Outside breeding period		
Harp seals of any age and sex	220	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	200
Hooded seals of any age and sex	0	0

5. OTHER ISSUES

5.1 Ban on seal 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. As concluded by NAMMCO, bans on seal products 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.

5.2 Observations of marine mammals on the ecosystem surveys

The PINRO and IMR scientists acknowledge the importance of ecosystem surveys in the research of the ecology of marine mammals in the Barents Sea. The PINRO and IMR scientists emphasize the need of two observers per ship (as defined in the survey protocol) and agreed on the necessity to continue aerial observation of marine mammals and environmental conditions from Russian research aircraft, which was carried out annually from 2003-2005 as part of ES. Aerial surveys are particularly efficient for obtaining high quality results from a large area over a short time

period.

5.3 Joint research program on grey seals

In Norway grey seal pup production surveys aimed to cover all the breeding colonies along the entire coast were conducted in 2006-2008 using boat based as well as aerial surveys. New pup production surveys were initiated in 2013, starting with coverage of the northmost parts of Norway (Finnmark and Troms). The surveys continued in 2014 and will be finished in 2015. 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. 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 8 October 2015.