

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 2018

Norwegian catches in the Greenland Sea (West Ice) in 2018 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 2018. Only 14 animals (whereof 6 were pups) were taken for scientific purposes. In addition, 3 pups were taken in the ordinary hunt, presumably because they were misidentified (as harp seal beaters) before they were shot. The 2018 TAC for harp seals in the Greenland Sea was set at

26 000 1+ animals (where 2 pups balance one 1+ animal), i.e. the removal level that would reduce the population with 30% over the next 15 year's period. Total catches in 2018 were 2,703 (including 1,218 pups) harp seals, representing only 5% of the identified sustainable level.

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 10,090 1+ animals (where 2 pups balance one 1+ animal) in the White and Barents Sea in 2018. 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 2009-2013. This ban was removed before the 2014 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 2015-2018. However, one Norwegian vessel, hunting in the southeastern Barents Sea (the East Ice) in 2018, took a total of 2,241 (including 21 pups) harp seals. This represented 22% of the identified sustainable level.

Norwegian and Russian catches in 2018, including catches under permits for scientific purposes, are summarized in the table below:

Area/species	Norway	Russia	Sum
GREENLAND SEA			
<i>Harp seals</i>			
Pups	1218	0	1218
Older seals (1yr+)	1485	0	1485
Sum	2703	0	2703
<i>Hooded seals</i>			
Pups	9	0	9
Older seals (1yr+)	8	0	8
Sum	17 ¹	0	17
<i>Area subtotal</i>	2720	0	2720
BARENTS SEA / WHITE SEA			
<i>Harp seals</i>			
Pups	21	0	21
Older seals (1yr+)	2220	0	2220
Sum	2241	0	2241
<i>Area subtotal</i>	2241	0	2241
TOTAL CATCHES	4961	0	4961

¹ Including animals taken under permit for scientific purposes

2. EXCHANGE OF INFORMATION AND SUMMARY REPORTS OF RESEARCH ACTIVITIES IN 2018

2.1 Norwegian research

2.1.1 Abundance estimation of harp and hooded seals in the Greenland Sea

In the period 18 - 31 March 2018 aerial surveys were performed in the Greenland Sea pack-ice (the West Ice), to assess the pup production of the Greenland Sea populations of harp and hooded seals. One fixed-wing aircraft, stationed in Akureyri (Iceland), was used for reconnaissance flights and photographic surveys along transects over the whelping areas. A helicopter, operated from the expedition vessel (K/V "Svalbard") also flew reconnaissance flights, and was subsequently used for monitoring the distribution of seal patches and age-staging of the pups.

The reconnaissance surveys were flown by the helicopter (18 – 22 March) and the fixed-wing aircraft (18 - 31 March) in an area along the eastern ice edge between 68°40' and 74°47'N. The ice cover was narrow and the edge closer to the Greenland coast in 2018 compared to previous survey years. The reconnaissance surveys were adapted to the actual ice configuration, usually flown at altitudes ranging from 160 - 300 m, depending on weather conditions. Repeated systematic east-west transects with a 10 nm spacing (sometimes 5 nm) were flown from the eastern ice edge and usually 20-30 nautical miles (sometimes longer) over the drift ice to the west.

Harp seal breeding was first observed from the fixed-wing on 18 March at approximately 74°00'N / 13°47'W, along with scattered hooded seal families further south. On 21 March, however, a large patch (considered to be the same patch as observed on 18 March) containing whelping harp and hooded seals was discovered in an area between 72°25'N and 72°35'N; 14°30'W and 16°00'W. Colour markers and satellite-based GPS beacons were deployed on ice floes north, east and south of the patch. The ship and helicopter had to depart from the ice on 24 March, but the fixed-wing aircraft continued to conduct reconnaissance surveys in the area. Based on observations made during these surveys, and information on localization of the identified whelping patches obtained from the ice-deployed GPS beacons, photographic surveys were conducted on 27 and 28 March. Subsequent reconnaissance surveys were conducted during 29 – 31 March to ensure that all whelping patches had been covered by the photographic surveys.

On 27 March, two photographic surveys were flown to cover the entire whelping patch area which was a little more than 60 nm in south-north direction. Due to fog in the northwest areas, these areas had to be re-visited with new transect surveys the following day (28 March). To define the transect lines for this second survey day, data from the ice-deployed GPS beacons were used to account for the ice drift between the two days. In total, 5104 photos were taken during the surveys (3016 photos on 27 March; 2088 photos on 28 March). Results from the aerial surveys will be used to estimate the 2018 harp and hooded seal pup production in the West Ice. Subsequently, the status of the stocks will be assessed by incorporating the pup production estimates into population models.

2.1.2 Harp seal migrations

In March 2018, 6 adult harp seal females were live captured in the West Ice immediately after the lactation period and brought back to Tromsø by a research vessel. In Tromsø the seals were kept in captivity during the entire moulting period. Subsequently, satellite based tags were deployed on the seals whereafter they were again transported by boat and released north of Bear Island in mid July. The experiment is in progress, and we still receive data from the transmitters.

2.2 Russian research

2.2.1 Ice conditions and harp seal pup production in the White Sea in 2018

As in 2017, no traditional Russian multispectral aerial research survey of pup production in the White Sea was conducted in March 2018 (last survey was made in 2013). For this reason, PINRO scientists focused as usual (since 2014) on monitoring of ice conditions in the White Sea and adjacent areas in the Barents Sea. This research is very relevant for evaluation of conditions for harp seal pup production in the White Sea (and potentially also in neighboring areas). All accessible information from satellites and some other sources were used. Ice condition mapping and satellite-based information was obtained from Internet (Norwegian Meteorological Institute - NMI; NOAA, USA – Terra/MODIS and Aqua/MODIS; European Space Agency (ESA) – Radarsat-2 or/and Santinel-1). Also, satellite images and other additional information were received from the Northern Hydrometeorological Center (Arkhangelsk) - NHMC by e-mail. In the last case, additional information was received from vessels and other sources about localization of pup production patches. Below are presented several example images from 2018 (for the peak time and end of harp seal pupping) obtained from some of the different sources.

Mid March is considered as the peak time for harp seal pupping in the White Sea. Ice conditions from this period in 2018 are presented in Figs 1 and 2. After this the whelping activity decreases and is usually totally finished 10 days later - in Figs 4 and 5 the ice condition situation at this time in 2018 are presented. As seen from Figs 1 and 2, ice conditions in the traditional pupping areas in the White Sea (“Gorlo” and “Basin”) during 2018 were good for safe whelping, better than in 2017 and nearly the same as in 2013 (when the most recent multispectral aerial survey was made) and the average over several years (climate situation). Information about the first whelping patches in 2018, discovered from icebreaker “Dixon”, was received through NMI. These patches were discovered on 8 March, and their position is presented in Fig. 3. Based on information from the icebreaker, the total size of this patch was assumed to be ca 2 000 individuals. Further whelping patches were observed from this icebreaker in the southern part of “Gorlo”, and it is marked with a blue flag in Fig. 2 - the total size this patch was about 3 000 individuals.

Ice conditions at the time when the pupping period finished are presented in Figs 4 and 5. As can be seen, the ice conditions in the entire White Sea area were good for safe whelping, and they were better than in 2017, and nearly the same as in 2013 when the last multispectral aerial survey was made. Given the ice conditions presented above, it seems reasonable to assume that the level of pup mortality in 2018 must have been comparable with the 2013 level when last multispectral

aerial survey was made, and less in comparison with the period from 2014-2017. As example, a fragment of the whelping patch observed from icebreaker “Dixon” is presented in Fig. 6. Here can be seen one adult harp seal and two pups among ice that provide safe whelping. However, correct data about the current situation of pup production of the White Se/Barents Sea harp seal population can be obtained only in a new multispectral aerial survey.

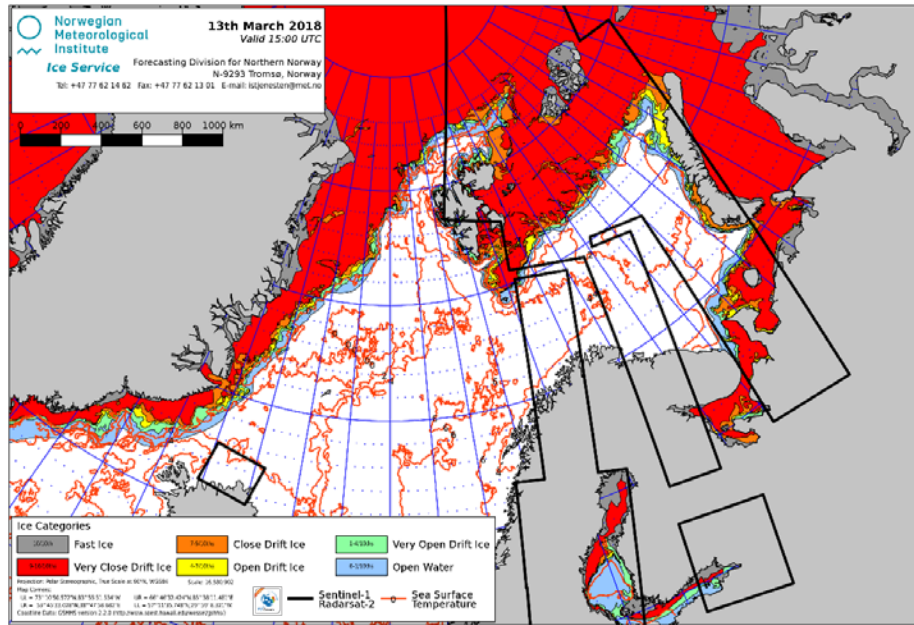


Figure 1 – Example of ice condition map on 13 March 2018 (from NMI)



Figure 2 – Example of satellite ice conditions image from TERRA/MODIS on 13 March 2018 with position of whelping patches (blue flag)

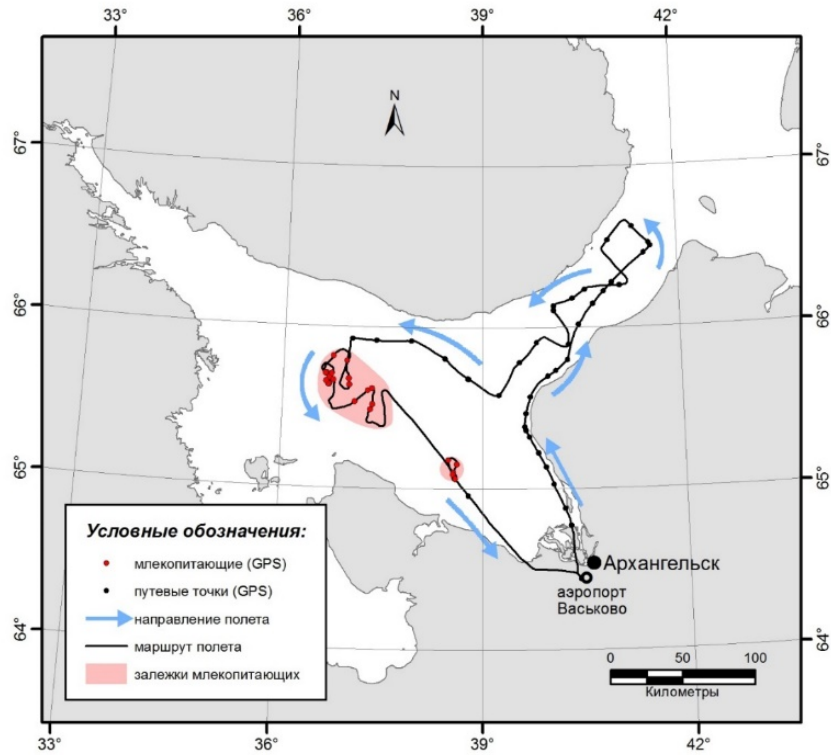


Figure 3 – First whelping patches (red spots and local pale red areas) discovered from icebreaker “Dixon” on 8 March 2018

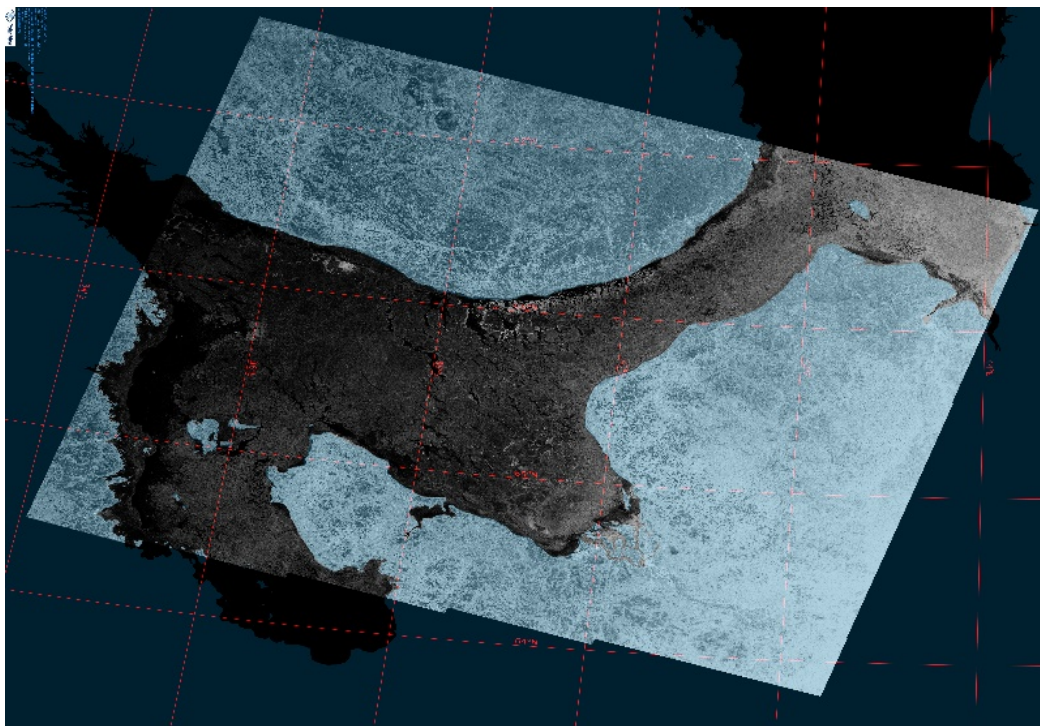


Figure 4 - Example of satellite ice conditions image from Sentinel-1 on 28 March 2018

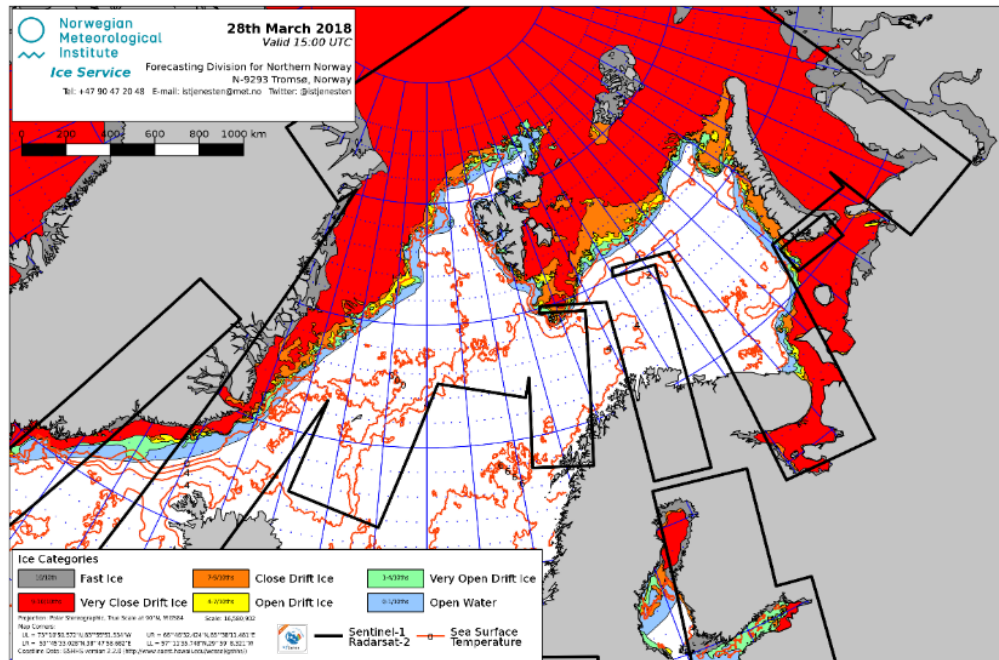


Figure 5 – Example of ice conditions map on 28 March 2018 (from NMI)



Figure 6 - Example of fragment of a whelping patch observed from icebreaker “Dixon” (one adult harp seal and two pups among ice that provide safe whelping)

2.2.2 Experience with use of Unmanned Aerial Vehicle (UAV)/drone for surveys of harp seals in the White Sea during whelping

A Russian specialist from “VNIRO” (Moscow), in cooperation with engineers from the company “Giprorybflot” (from S.-Petersburg), tried for the first time to use a drone for surveys of harp seal pups in the White Sea during whelping in March 2018. The main purpose was to test the feasibility of using drones in such surveys, as an alternative to an aircraft. For this purpose, a Russian UAV named “Orlan-10” was used (Fig. 7)



Figure 7 – The applied drone “Orlan-10”

The “Orlan-10” main technical characteristics:

- Take-off mass - 14 kg,
- Load mass – 5 kg,
- Take-off – from collapsible catapult,
- Landing – by parachute,
- Air speed – 90-150 km/h,
- Max. flight duration – 16 h,
- Max. distance from ground operated station – 120 km,
- Max. altitude – 5000 m,
- Max. wind speed in take-off – 15 m/s.

During the “Orlan-10” flights, the same remote sensing equipment as used in traditional aircraft multispectral aerial surveys, was installed (photo- and video cameras, infra-red (IR) scanner) but all this equipment was smaller and lighter. Three drones were used during the experiment, only one of them was used with direct connection with ground operated station.

All flights were made from Varzuga (on the Kola Peninsula southern coast) on 21, 23 and 24 March. On 22 March no flights were carried out due to poor weather conditions. On March 23 two drones made surveys simultaneously. Total survey flight duration was 36h 49min, on 21

March – 8h 10min, on 23 March – 19h 58min (two drones participated), on 24 March – 8h 41min. The drones covered an area from the coast to latitude 65°40'N between 37°00'E and 39°00'E (Fig. 8). To understand the coverage area of the current UAV survey in comparison with the area covered by the multispectral aerial survey in 2013 (last aerial survey with duration 30h 30 min.), survey lines from both surveys are shown in Fig. 8.

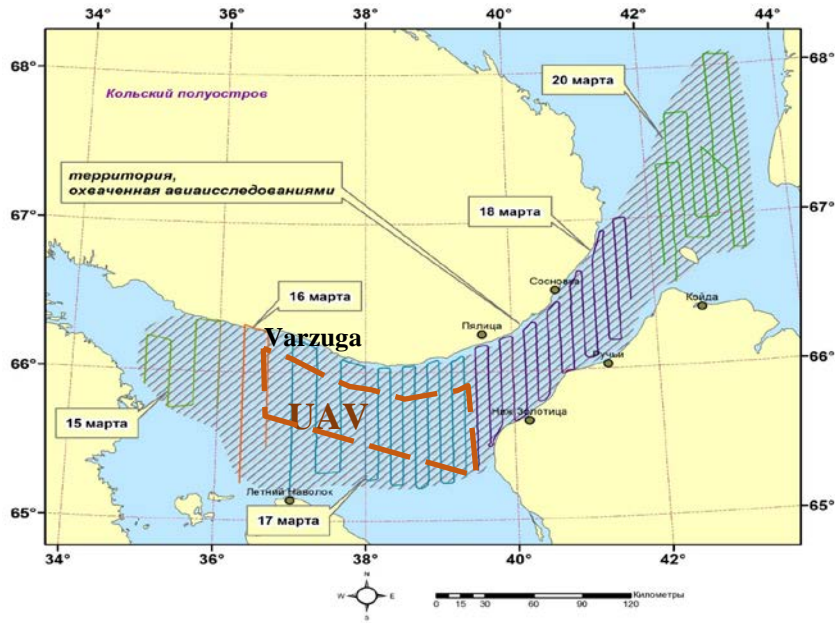


Figure 8 – Comparison between areas covered by the UAV in 2018 and by aircraft in the multispectral surveys in 2013.

All UAV flights were successful, and all survey equipment worked as planned, giving substantial information (photo-, video, IR images). At present the data are being processed and analysed by PINRO specialists. In Fig. 9, an example of one photo image is presented.

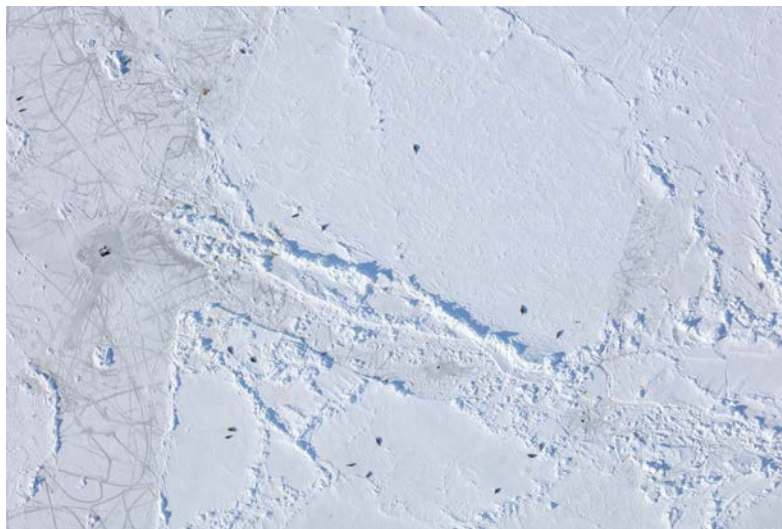


Figure 9 – Example of photo image from the drone.

2.3. Joint Norwegian-Russian work

2.3.1 Joint studies of life history parameters

Data for assessment of biological parameters were collected from 170 harp seal females during commercial sealing in the East Ice in 2018 – analyses are in progress. In addition to the biological parameters, samples were also taken for studies of contaminants and ecology (stable isotopes) from some of the sampled females and 5 additional males.

3. STATUS OF STOCKS AND MANAGEMENT ADVICE FOR 2019

The ICES Working Group of Harp and Hooded Seals (WGHARP) met during 26-30 September 2016 at the ICES HQ in Copenhagen, Denmark, to assess the status and harvest potential of stocks of Greenland Sea harp and hooded seals and harp seals in the White Sea. The advice given by ICES in October 2016, based on the 2016 WGHARP meeting, were used by this Working Group on Seals to establish management advice for 2019 to the JNRFC.

The basis for the advice was a request from Norway in October 2015 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 15-year period. 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 strictly 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 2019 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 2019.

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 N_{30} (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 2017 total population of 80 460 (95% C.I. 59.020-101.900).

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 management 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 (2017) abundance of 676 500 (95% C.I. 490.190-862.810) 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 76% over the 15 year's period 2017-2032, whereas a catch of 21 500 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 15-year period in such a manner that it would remain above a level of 70% of current level with 80% probability are 26 000 1+ animals, or an equivalent number of pups (where one 1+ seal is balanced by 2 pups), in 2017 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 2019:

- *If the management objective is to maintain the population at current level, a TAC of 21 500 1+ animals or an equivalent number of pups, is recommended.*
- *If the management objective is to reduce the population towards N_{70} over a 15-year period, a TAC of 26 000 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

Duration of the hunting season in the White Sea and adjacent water of the Barents Sea, including the south-eastern part, is dependent on the ice conditions. Taking into account long term forecast for ice conditions for 2019, both Parties **recommends** that the opening date for the 2019 hunting season is set at 20 March, while the closing date is set at 1 June 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 2019.

3.2.1. Harp seals

Russian aerial surveys of the White Sea harp seal pups were conducted in March in 1998 to 2013

using traditional strip transect methodology and multiple sensors. The results obtained may indicate a reduction in pup production after 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 2017 abundance of 1 408 200 (95% C.I. 1.251.680-1.564.320). The modelled total population indicates that the abundance decreased from its highest level in 1946 to the early 1960s, whereafter an increase has prevailed. Current level is 67% of the 1946 level.

Catch estimation: The last available information about the reproductive potential for the Barents Sea / White Sea harp seal population is based on data from 2006, i.e., more than 5 years old, and the population is considered “data poor”. In such cases ICES usually recommend to use the PBR approach to estimate catch quotas. Using the traditional PBR approach, removals were estimated to be 39 985 seals (irrespective of age). However, this catch option indicates a 33% reduction of the 1+ population over the next 15 years. More conservative PBR approaches (but still within the defined framework of the method) were attempted as well, but they also resulted in population reductions (of 10-25%) over the next 15 years.

Using the population assessment model, an equilibrium catch level of 10 090 1+ animals, or an equivalent number of pups (where one 1+ seal is balanced by 2 pups), was estimated for 2017 and

subsequent years. This equilibrium catch is considerably lower than that estimated in previous assessments. The reason for this is the lower pregnancy rates assumed in the projections (an average of known values instead of the last measured rate), and this highlights the need for new samples. Such samples are best obtained from 1+ animals taken in commercial hunting in the harp seal moulting areas in the southeast Barents Sea. Despite 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 2019: A TAC of 10 090 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 2019, 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 2019+

4.1. Norwegian investigations

Secure that the stocks remain data rich:

- Analyze data collected during the new aerial survey to assess the harp and hooded seal pup production in the West Ice in March/April 2018
- Analyze new (from 2018) and older data on biological parameters for harp seals from the East Ice
- Produce new abundance estimates for harp and hooded seals and use to develop new advice in ICES WGHARP in September 2019
- Collect new data on biological parameters for harp seals in the West Ice in 2019 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 2019 hunt if possible

Focus on the difficult stock situation for hooded seals:

- Analyzes of collected biological material, and publication of results from the West Ice

Seal diets

- Publish new data on diet and stable isotopes from harp seals and their prey in the Barents Sea

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

- Funding secured, will be attempted in April/May 2019

Observations of marine mammals on the ecosystem surveys

- Continues in 2019 - the survey will be extended to include also the polar ocean

4.2. Russian investigations

Study of correlation between ice conditions in the White Sea and adjacent areas of the Barents Sea and harp seals of the White Sea/Barents Sea population;

Multispectral aerial surveys of harp seal pups 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 – as planned;

Tagging with satellite-based tags, harp seals in the White Sea – as planned;

Marine mammals coastal research and observations including collection of biological samples – as planned;

Comprehensive aerial research surveys of marine mammals in the Barents and Kara Seas including collect information about environmental conditions and the distribution of fish species and other marine organisms – as planned;

During the annual ecosystem surveys in the Barents and Norwegian Seas, sightings of marine mammals will be obtained from research vessel and, if possible, from research aircraft;

Collect data on marine mammals distribution on board commercial vessels by scientific observers;

Sampling of biological material will occur during the commercial harp seal catch – as planned.

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 2013-2018, these limitations were removed, but lack of funding hampered the tagging of seals this year. In 2019 IMR has succeeded in obtaining funding to carry out satellite tagging in the White Sea. During the planned tagging experiment, scientists from PINRO, IMR and Murmansk Marine Biological Institute (MMBI, as invited by IMR) will participate in field work. PINRO will provide the necessary logistics required for aircraft and helicopter- or boat-based live catch of seals in April-May 2019. IMR will, as before, be responsible for aircraft, helicopter or boat rent payment, 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 PINRO and IMR scientists, subsequently also for MMBI scientists. Both US and Russian transmitters can be used. The transmitters cannot collect geographically positioned temperature and salinity data.

After the 2019 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 will carry out vessel trips, 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.

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 2019:

Area/species/category	Russia	Norway
Barents Sea / White Sea		
<u>Whelping grounds</u>		
Harp seals of any age and sex	105	0
Harp seal pups	30	0
<u>Outside breeding period</u>		
Harp seals of any age and sex	15	500
Greenland Sea		
<u>Whelping grounds</u>		
Adult breeding harp seal females	0	0
Harp seal pups	0	0
Adult breeding hooded seal females	0	50
Hooded seal pups	0	50
<u>Outside breeding grounds</u>		
Harp seals of any age and sex	0	200
Hooded seals of any age and sex	0	0

5. OTHER ISSUES

5.1 Norwegian whaling in REZ

The Norwegian commercial hunt for minke whales has been conducted annually in Norwegian and adjacent waters since the late 1920s. Up to 1987 the hunting areas included both the Norwegian and Russian parts of the Barents Sea. The hunt was preliminary stopped in 1988-1992. When the hunt was resumed in 1993, however, Norwegian whalers were no longer permitted to hunt minke whales in the REZ parts of the Barents Sea. The southeast parts of the Barents Sea used to be very important hunting areas for Norwegian whalers. This applies especially to the areas extending eastwards to 40°E, and northwards to 75°N. Therefore, both Parties strongly **recommend** that this area should be reopened for Norwegian whalers during the whaling season from mid April to early September.

As a preliminary attempt, it is suggested that 5 Norwegian whalers are permitted to operate in the area in 2019 and 2020, each with two Russian observers onboard to secure transfer of whaling knowledge to Russia. The annual whaling quotas for the Northeast Atlantic (including also the Barents Sea) are calculated using the Revised Management Procedure (RMP) developed by the International Whaling Commission (IWC). The intention will be that up to 20% of this quota can be allocated to the defined area of the REZ. An evaluation and potential prolongation of whaling in REZ will be conducted after two years of activity.

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 2014-2016 and will be finished in 2018. 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 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 16 October 2018.