Appendix 10

JOINT RUSSIAN – NORWEGIAN SCIENTIFIC RESEARCH PROGRAM ON LIVING MARINE RESOURCES IN 2019

Contents

1. Planning and coordination of investigations and submitting of results.

This appendix contains the program for investigations to be carried out in 2019 by Norway and Russia within the frames of the bilateral cooperation between the Norwegian and Russian Parties. The program is in accordance with the national research programs.

Planning coordination and exchange of specialists will be settled between the institutes involved.

Russian and Norwegian research institutes will exchange results and data from joint investigations.

Norwegian and Russian scientists and specialists will meet in Murmansk, 11-15 March 2019 to discuss joint research programs, results from surveys and investigations in 2018/2019 and to coordinate survey plans for the rest of 2019. The cruise plans listed below are preliminary and may change. Missing names of vessels and time periods for surveys in this report will be agreed by correspondence, latest by the March meeting. Future plans for surveys and methodology for preparing biological and acoustic data will be discussed and coordinated. Urgent information according to surveys carried out before the meeting in March will be exchanged by correspondence.

In the future work it is very important to take into account experiences from recent developments in the ecosystem such as environmental factors, introduction of new species, distribution and stock sizes of commercial species.

A preliminary program for the planned surveys and cooperation for 2019 is presented below. The outlined plans should be considered a draft and will be shared when final plans are available.

In order to increase robustness of joint surveys the parties considered increasing the flexibility of mutual access to each other zones. Different mechanisms are possible and needs to be considered further. Appropriate applications for research vessels entering to the EEZ's must be ready in sufficient time before Winter and Barents Sea ecosystem surveys.

2. Investigations on fish and shrimp stocks, including stock size, structure and distribution.

IMR and PINRO will continue the co-operation on the monitoring of the most important commercial species. The parties will exchange primary information during joint investigations according to agreed formats.

Norwegian surveys

Nation:	Norway	Survey title:	Cod spawning stock
Reference No.:	N-2-01		
Organization:	IMR		
Time period:	March – April	Vessel:	R.V. "Johan Hjort"
Target species:	Cod	Secondary species:	Haddock, saithe
Area:	Spawning areas Troms – Lofoten		
Purpose:	Acoustic survey of the North East Arctic Cod spawning stock. Investigations on maturity, fecundity and egg abundance.		
Reported to:	IMR survey report, ICES AFWG		

Nation:	Norway	Survey title:	Fjord and coastal ecosystem survey
Reference No.:	N-2-02		
Organization:	IMR		
Time period:	October-November	Vessel:	R.V. "Johan Hjort" R.V. "Kristine Bonnevie"

Target species:	Saithe, coastal cod, 0-group herring	Secondary species:	Haddock, *Sebastes norvegicus*
Area:	Norwegian fjords and coastal areas		
Purpose:	Acoustic and trawl abundance estimation of saithe, coastal cod and other groundfish species. Acoustic abundance estimation of 0-group herring. Environmental investigations.		
Reported to:	IMR survey report, ICES WGWIDE, ICES AFWG		

Russian surveys

Nation:	Russia	Survey title:	Multispecies trawl-acoustic survey for estimation of juveniles and stock assessment of demersal fish in the Barents Sea and adjacent waters
Reference No.:	R-2-01		
Organization:	PINRO		
Time period:	October-December	Vessel:	R.V. "Vilnius" Other R.V.
Target species:	Cod, haddock, saithe, redfishes, Greenland halibut	Secondary species:	Northern wolffish, spotted catfish, plaice, long rough dab and others
Area:	The Barents Sea and adjacent waters, Spitsbergen area, Exclusive Economic Zone of Norway, international waters, Exclusive Economic Zone of the Russian Federation, internal sea waters and territorial sea of the Russian Federation.		
Purpose:	Evaluation of strength of yearclasses of cod and haddock at the stage of bottom juveniles, redfishes and other demersal fish; assessment of total and fishable stocks of Greenland halibut, cod, haddock, redfishes, catfishes, long rough dab and other fish species; estimation of zooplankton biomass; parasitologic and faunistic studies, study of "predator-prey" relations; oceanography; euphausiids.		
Reported to:	PINRO survey report, ICES AFWG		

Joint surveys

Nation:	Norway/Russia	Survey title:	Joint Russian-Norwegian multispecies trawl-acoustic survey for demersal fish stock assessment (Winter Survey)
Reference No.:	J-2-01		
Organization:	IMR, PINRO		
Time period:	January-March	Vessel:	R.V. "Helmer Hanssen" R.V. "G.O. Sars" R.V. "Vilnius"
Target species:	Cod, haddock, Greenland halibut, catfishes, saithe, redfishes	Secondary species:	Other demersal and pelagic species
Area:	The Barents Sea and adjacent waters, Exclusive Economic Zone of the Russian Federation, internal sea waters and territorial sea of the Russian Federation, Exclusive Economic Zone of Norway, Spitsbergen area		
Purpose:	Assessment of the yearclasses, abundance and biomass cod and haddock, other demersal species, collection of biological samples, oceanography.		
Reported to:	Joint IMR/PINRO Report Series, ICES AFWG		

Nation:	Russia/Norway	Survey title:	International ecosystem survey in the Nordic Seas
Reference No.:	J-2-02		
Organization:	PINRO, IMR		
Time period:	May – June	Vessel:	R. V. "Vilnius" R.V. "G.O.Sars", 3 research vessels
Target species:	Herring, blue whiting	Secondary species:	Other pelagic species
Area:	The Norwegian Sea, fishing zone of the Faeroe Islands, international waters, Exclusive Economic Zone of Norway, UK fishery zone, The Barents Sea and adjacent waters, Exclusive Economic Zone of the Russian Federation, internal sea waters and territorial sea of the Russian Federation		
Purpose:	Estimation of yearclass strength, abundance and biomass of herring and blue whiting, studies of their distribution and behaviour, marine mammal distribution and quantity. Acoustic survey of the stocks, oceanography, plankton.		
Reported to:	PINRO, IMR survey reports, International report, ICES WGWIDE, ICES WGIPS		

Nation:	Norway/Russia	Survey title:	Joint Russian-Norwegian ecosystem survey (BESS).
Reference No.:	J-2-03		
Organization:	IMR, PINRO		
Time period:	August-October	Vessel:	R. V. "Vilnius" R.V. "G.O.Sars" R.V. "Johan Hjort" R.V. "Helmer Hanssen"
Target species:	Cod, haddock, saithe, catfishes, redfishes, Greenland halibut, plaice, herring, capelin, polar cod, shrimp, snow crab.	Secondary species:	Other pelagic and demersal species, benthic organisms, sea mammals and birds, oceanographic and hydrobiological parameters
Area:	The Barents and adjacent waters, Spitsbergen area, Exclusive Economic Zone of Norway, international waters, Exclusive Economic Zone of the Russian Federation, and territorial waters of the Russian Federation. The Kara Sea.		
Purpose:	Investigations of distribution and abundance of 0-group of different species, estimation of abundance and biomass of pelagic species, demersal species, shrimp, snow crab, Greenland halibut juveniles, marine mammal and sea birds distribution and quantity. Oceanography, plankton, species interactions, sampling for determining pollution levels.		
Reported to:	Joint IMR/PINRO Report Series, ICESACOM, ICES WGHARP, NAMMCO, ICES WGIBAR		

Nation:	Norway/Russia	Survey title:	Joint Russian-Norwegian pre-spawning acoustic survey on capelin
Reference No.:	J-2-04		
Organization:	IMR, PINRO		
Time period:	January-March	Vessel:	3 commercial vessels
Target species:	Capelin	Secondary species:	Other demersal and pelagic species

Area:	The Barents Sea and adjacent waters, Exclusive Economic Zone of the Russian Federation, internal sea waters and territorial sea of the Russian Federation, Exclusive Economic Zone of Norway, Spitsbergen area
Purpose:	Investigations about abundance and distribution of spawning capelin. Collection of biological samples, oceanography.
Reported to:	Joint IMR/PINRO Report Series, ICES AFWG

3. Research program on deep sea fishes

To assess the stock of *Sebastes mentella* in the open Norwegian Sea, an internationally coordinated redfish survey has been established (ICES WIDEEPS, earlier WGRS). This survey is a collaborative effort between Norway, Russia and the Faroes, coordinated by ICES. It is also supported by the Data Collection Framework of the EU. This survey was run as a coordinated effort by Norway, Russia and the Faroes in 2009. It was not conducted in 2010-2012, but was run by Norway in September 2013 and August 2016. The next survey is planned for August 2019 and to be re-conducted every three years. Results contribute directly to the ICES groups WGIDEEPS and AFWG.

A multi annual survey plan for monitoring of deep sea species is in action for Norwegian surveys. In 2019 the northern deepwater slope will be surveyed with Greenland halibut and redfish as main target species. In 2018 the southern deepwater slope was surveyed with Greater argentine, beaked redfish and Greenland halibut as main target species.

In ICES Benchmark in 2015 two new survey indices for Greenland halibut were derived from the Joint Ecosystem Survey, and precursor surveys. In this context it is important that coverage of the nursery area in northern Barents Sea and northern Kara Sea is sustained in the survey.

According to this the following surveys are applied for in 2019:

Norwegian surveys

Nation:	Norway	Survey title:	Northern Deepwater Slope Survey (Egga-Nord)
Reference No.:	N-3-01		
Organization:		IMR	
Time period:	November	Vessel:	R.V. “G.O.Sars”
Target species:	Greater argentine, beaked redfish and Greenland halibut	Secondary species:	Other Deep water species and elasmobranches
Area:		Ecosystem along the Norway slope from 68 to 80 degrees north.	
Purpose:	Primary objective: to assess the state of commercial deepwater fish stocks. Secondary objective: to monitor the state of deepwater ecosystems along the slope. Part of IMR's multiannual survey strategy for deepwater species.		
Reported to:	IMR survey report, ICESAFWG, ICES WGEF, ICES WGDEEP. ICES WIDEEPS		

4. Red king crab (*Paralithodes camtschaticus*) andsSnow crab (*Chionoecetesopilio)*

Both Parties exchanged information about the ongoing national Red king crab and snow crab research and fishery in 2018 and the research plans for 2019.

The parties agreed that some of the questions of biology, stock assessment and fishery of crabs require further research. The parties confirmed their intention to continue the study of the following issues:

- Ecological role of the red king crab and the snow crab in the Barents Sea;
- Main life history parameters of these two crab species introduced into the Barents Sea;
- New methods for crab stock assessments and monitoring (sampling gears, survey area etc.)

Scientists from Russia and Norway will conduct a number of national surveys on the red king crab and snow crab in the Barents Sea. The objectives of these surveys are: to assess distribution, abundance, size/sex composition and biological characteristics of the crabs, in addition to tagging experiments. Some investigations should focus on red king crab by-catches in the trawl fishery for demersal fish aiming to search of means for minimization of the red king crab by-catches in fisheries for cod and haddock. Development of a better sampling device for snow crab will also be considered. Details on investigations of the snow crab stock in its distribution will be discussed at the March meeting.

Information will be exchanged between scientists and the results will be presented in survey reports and publications.

5. Fishing technology and selectivity of fishing gears

Research activity in these fields is carried out with the aim to develop:

- Fishing gears that are more species and size selective and that have less negative impact on fish that escape the gear, and have less negative ecosystem effects in general.
- Improved survey gears and methodology.

As part of the Centre for Research-based Innovation (CRISP) activity, a photographic system (Deep Vision) that automatically identifies species and sizes of individuals passing through a trawl has been tested during several research cruises. The Deep Vision system has been put in operation during the International ecosystem survey in the Nordic Seas in May.

Scientists from IMR and PINRO will continue the development of survey trawls to improve and ensure adequate survey sampling techniques.

6. Marine mammals

The effect of various marine mammal species, in particular harp seals, on biological resources of the Barents and Norwegian Seas is considerable. Besides, harp, hooded, grey and harbour seals and minke whales have traditionally been target species for hunt operations. Other species, such as white whales, ringed and bearded seals may also be of potential future interest for hunting. There is therefore a need for joint research on marine mammals, including boat based and airborne surveys, in offshore as well as coastal areas. The joint Russian-Norwegian research should be aimed at assessments of distribution and abundance of the most important species, and their trophic linkages with other marine resources, with particular emphasis on fish species. The low population size of hooded seals in the Greenland Sea and apparent decrease in harp seal pup production in the White Sea in recent years is a matter of concern, which requires increased research and monitoring effort.

Norwegian activities in 2019 include abundance estimation of harp and hooded seals based on data obtained in aerial and boat based surveys in the Greenland Sea in March 2018. Furthermore, sampling of biological material from harp seals (to assess their reproductive and nutritive status) during commercial sealing in the Greenland Sea (the West Ice) will be conducted. Analyses of biological material from hooded seals, collected during research surveys in the Greenland Sea, and from harp seals, collected in the southeast Barents Sea (the East Ice) continues. Furthermore, boat based surveys to estimate abundance and population structure will be carried out in Norwegian coastal areas for

harbour seals. Comprehensive line-transect sighting surveys for minke whales (and other whales) will be conducted in the Norwegian and Barents Sea in 2019. These surveys are included in a six-year cycle (2014-2019) of sighting surveys which will result in new, updated whale estimates for the Northeast Atlantic area in 2020. Satellite tags will be deployed on minke whales and other whale species on the coast of North Norway during autumn and winter in 2019. Satellite tags will also be deployed on harp seals in the Greenland Sea at the end of the moulting season in spring 2019. Samples to assess hunting methods, diets and life history parameters will be obtained from the commercial minke whale hunt.

Russian activities in 2019 will include 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. Also, if possible in 2019, Russia plan to continue carryout of 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. Standard multispectral method will be applied. Besides and 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 of marine mammals will be obtained from research vessels and, if possible, from research aircraft. 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.

As part of the Joint Norwegian-Russian Research Program on Harp Seal Ecology, telemetric investigations of harp seals will be carried out in the White Sea in a joint Norwegian-Russian project in spring 2019. This activity will be given priority over other planned research of harp seals of the White/Barents Seas population. Joint observations of marine mammals on the ecosystem surveys will continue.

Norwegian surveys

Nation:	Norway	Survey title:	Monitoring of biological parameters, harp seals
Reference No.:	N-6-01		
Organization:	IMR		
Time period:	March-May	Vessel:	1 sealer
Target species:	Harp seal	Secondary species:	
Area:	Greenland Sea		
Purpose:	Collection of biological material from harp seals during commercial sealing.		
Reported to:	ICES, NAMMCO, JNRFC		

Nation:	Norway	Survey title:	Harp seal tagging in the Greenland Sea
Reference No.:	N-6-02		
Organization:	IMR		
Time period:	March-April	Vessel:	Rented vessel
Target species:	Harp seals	Secondary species:	
Area:	Greenland Sea (West Ice)		
Purpose:	Study of the harp seal biology and ecology using satellite telemetry, comparison with previous tagging to see effect of receding ice.		

Reported to:	IMR survey report, NAMMCO, ICES, JNRFC

Nation:	Norway	Survey title:	Boat based studies of harbour seal abundance
Reference No.:	N-6-03		
Organization:	IMR		
Time period:	August-September	Vessel:	Rented vessel
Target species:	Harbour seals	Secondary species:	
Area:	Mid Norwegian coast (Trøndelag, Nordland)		
Purpose:	Estimation of the total number of harbour seals by visual observations and use of drones.		
Reported to:	NAMMCO, ICES		

Nation:	Norway	Survey title:	Genetic studies of harbour seal population structure
Reference No.:	N-6-04		
Organization:	IMR		
Time period:	November	Vessel:	Rented vessel
Target species:	Grey seals	Secondary species:	
Area:	West Norwegian coast		
Purpose:	Collection of biopsy samples from harbour seal pups, to be used in DNA analyses		
Reported to:	NAMMCO, ICES		

Nation:	Norway	Survey title:	Telemetric tagging of minke whales
Reference No.:	N-6-05		
Organization:	IMR		
Time period:	November	Vessel:	Rented vessels
Target species:	Minke whales	Secondary species:	Humpback whales, fin whales
Area:	Coast of North Norway		
Purpose:	Telemetric tagging of minke whales.		
Reported to:	IWC, NAMMCO		

Nation:	Norway	Survey title:	Ecological studies of minke whales
Reference No.:	N-6-06		
Organization:	IMR		
Time period:	August	Vessel:	Whalers
Target species:	Minke whales	Secondary species:	
Area:	Norwegian coast - Barents Sea - Spitsbergen		
Purpose:	Collection of material from whales taken in commercial hunt, material to assess diet and life history parameters.		
Reported to:	IWC, NAMMCO		

Nation:	Norway	Survey title:	Studies of hunting methods and animal welfare issues in the hunt of minke whales
Reference No.:	N-6-07		
Organization:	IMR		

Time period:	June-August	Vessel:	Whalers
Target species:	Minke whales	Secondary species:	
Area:	Norwegian coast - Barents Sea - Spitsbergen		
Purpose:	Observations and collection of material from whales taken in Norwegian commercial hunt to assess hunting methods and animal welfare issues.		
Reported to:	IWC, NAMMCO		

Nation:	Norway	Survey title:	Line transect surveys of minke whales
Reference No.:	N-6-08		
Organization:	IMR		
Time period:	July - August	Vessel:	Rented vessel
Target species:	Minke whales	Secondary species:	Other large whales
Area:	Norwegian and Barents Sea		
Purpose:	Sighting surveys to assess abundance of minke whales, and abundance, distribution and species composition of other marine mammals.		
Reported to:	IWC, NAMMCO		

Russian surveys

Nation:	Russia	Survey title:	Multispectral aerial surveys of harp seal whelping patches
Reference No.:	R-6-01		
Organization:	PINRO		
Time period:	March	Vessel:	Research aircraft
Target species:	Harp seal	Secondary species:	White whale, walrus and other species of marine mammals
Area:	The White Sea and the Barents Sea adjacent area, Exclusive Economic Zone of the Russian Federation, internal sea waters and territorial sea of the Russian Federation		
Purpose:	Study of distribution and abundance (by estimation of number of pups in the whelping patches) of the White Sea harp seal population, study of harp seal ecology and their influence on fish species as top predators.		
Reported to:	PINRO survey report, ICES WGHARP, JRNFC, NAMMCO		

Nation:	Russia	Survey title:	Comprehensive aerial research surveys of marine mammals
Reference No.:	R-6-02		
Organization:	PINRO		
Time period:	July-September	Vessel:	Research aircraft
Target species:	Minke whale, fin whale, humpback whale, white whale, white-beaked dolphin, harp, ringed, grey, common, and bearded seals, walrus	Secondary species:	Hooded seal, and other species of marine mammal, seabirds, fish schools, oceanographic and hydrobiological parameters
Area:	The Barents and Kara Seas		

Purpose:	Study of marine mammal distribution and abundance in relation to environmental conditions, fish species and other marine organisms' distribution for better understanding of the effect of marine mammals on the main commercial fishes and for use in ecosystem models for management of commercial living marine resources
Reported to:	PINRO survey report, ICES, JRNFC, NAMMCO

Nation:	Russia	Survey title:	Marine mammal coastal research and observations including collection of biological samples
Reference No.:	R-6-03		
Organization:	PINRO		
Time period:	March-September	Vessel:	Coastal expedition with the use of available transport and different types of boats
Target species:	Harp seal, minke whale, fin whale, humpback whale white whale, ringed, grey, common, and bearded seals	Secondary species:	Other species of marine mammals and fishes
Area:	Coast of the Barents, White and Kara Seas		
Purpose:	Collection of biological data, study of distribution and migration routes, estimation of numbers, marine mammals monitoring, assessment of marine mammal influence on fish species, assessment of climatic changes and human activities on marine mammals, data for ecosystem modelling		
Reported to:	Internal PINRO survey report, ICES, JRNFC, NAMMCO		

Nation:	Russia	Survey title:	Opportunistic marine mammal sightings during International ecosystem survey of the Northern Seas
Reference No.:	R-6-04		
Organization:	PINRO		
Time period:	May-June	Vessel:	PINRO research vessel
Target species:	Minke whale, fin whale, humpback whale, white whale, white-beaked dolphin	Secondary species:	Hooded seal, harp, ringed, grey, common, and bearded seals, walrus, and other species of marine mammal, seabirds, fish schools, oceanographic and hydrobiological parameters
Area:	The Barents Sea and south-eastern part of the Norwegian Sea		
Purpose:	Study of marine mammal distribution and abundance in relation to environmental conditions, fish species and other marine organisms' distribution for better understanding of the effect of marine mammals on the main commercial fishes and for use in ecosystem models for management of commercial living marine resources		
Reported to:	PINRO survey report, ICES, JRNFC, NAMMCO		

Nation:	Russia	Survey title:	Opportunistic marine mammal sightings during annual Joint Russian-Norwegian ecosystem survey
Reference No.:	R-6-05		
Organization:	PINRO		
Time period:	August-October	Vessel:	PINRO research vessel
Target species:	Minke whale, fin whale, humpback whale, white whale, white-beaked dolphin	Secondary species:	Hooded seal, harp, ringed, grey, common, and bearded seals, walrus and other species of marine mammal, seabirds, fish schools, oceanographic and hydrobiological parameters
Area:	The Barents Sea		

Purpose:	Study of marine mammal distribution and abundance in relation to environmental conditions, fish species and other marine organisms' distribution for better understanding of the effect of marine mammals on the main commercial fishes and for use in ecosystem models for management of commercial living marine resources
Reported to:	PINRO survey report, ICES, JRNFC, NAMMCO

Joint surveys

Nation:	Russia/Norway	Survey title:	Harp seal tagging in the White Sea in the frames of marine mammal coastal research
Reference No.:	J-6-01		
Organization:	IMR, PINRO		
Time period:	April-May	Vessel:	1 helicopter, vessel, boats
Target species:	Harp seal	Secondary species:	Other seal species, whales
Area:	The White Sea area		
Purpose:	Study of the harp seal biology and ecology using satellite telemetry. Part of the Norwegian Russian Research Program on Harp Seal Ecology initiated by JNRFC. Marine mammals monitoring, assessment of marine mammal influence on fish species, assessment of climatic changes and human activities on marine mammals		
Reported to:	Joint IMR/PINRO survey report, JNRFC, ICES WGHARP, ICES AFWG, ICES WGMME, NAMMCO		

7. Investigations on age determination of fish

The exchange of age reading specialists and material for cod, haddock, redfish, Greenland halibut and capelin will continue. Twice every year otoliths are exchanged between the institutes and meetings between age readers are usually held every second year.

For capelin a meeting was held in Murmansk in October 2017. The next meeting for cod and haddock will be held in Murmansk in 2019.

There continues to be differences in opinion between PINRO and IMR regarding age reading methods for redfish and Greenland halibut. Further work will be discussed during the March meeting 2019.

8. Investigations on survey methodology, index calculations and assessment methods

PINRO and IMR hold on to the ideas of developing a joint program on methods and procedures for assessment of important fish stocks in the northern areas. This program should include methods for surveys, methods for calculations of survey indexes and methods for improving assessment tools, including the multispecies and ecosystem models.

Russian and Norwegian colleagues continue to develop new databases and software to make stock size estimates in a consistent, common, and quality assured way.

Coordination of joint surveys in the Barents Sea

Russian and Norwegian institutions see the need to continue the optimization of survey strategies, given the limited access to resources, both in terms of experts, ships and financial supporting for such activities. This issue remains one of the most difficult and requires very careful consideration. Many different aspects such as assessment needs, finance, prioritization of work, time period, etc. need be

taken into account. Scientists will discuss survey strategies and implementation of an appropriate multi-year survey plan during the March meeting.

The Svanhovd expert group in 2014 recommended combining Norwegian-Russian winter survey, a Norwegian Lofoten survey, and a Russian ground fish survey into one joint survey in winter with step-wise implementation starting in 2015. For some reasons, it was not fully implemented. During a meeting in Murmansk during 17-18 October 2017 a report was prepared, outlining a plan for joint monitoring. During the March Meeting in Tromsø 2018, The parties agreed to start implementing the plan for conducting joint monitoring of the Barents Sea as described in the "Report from a meeting between experts from PINRO and IMR to discuss long term monitoring plan in the Barents Sea. Murmansk, 17-18 October 2017".

ICES now has annual survey working groups for all main Seas where ICES provides fisheries advice, except the Barents Sea. Such groups review the survey methodology in the given area. Russian and Norwegian scientists met for discussing Barents Sea survey methodology in connection with ICES AFWG 2018.

Research in the Arctic Ocean

The Arctic Ocean is experiencing major transformations. The reduction in the Arctic sea ice coverage has already made vast areas of the waters in the Arctic under Norwegian and Russian jurisdiction and beyond accessible for increased human activity. This development will increase pressures on vulnerable Arctic Ocean ecosystems, and impose new challenges for their sustainable management. Changes in this heat flow have profound implication for the marine environment and the living marine resources in the Arctic Ocean. Colonization of new regions by immigrating species is also more likely on this side of the Arctic compared to the Pacific side. In a pan-Arctic perspective, increasing the scientific knowledgebase and ecosystem understanding, exploring potential options for providing ecosystem-based advice, and establishing long-term monitoring programs in the Arctic Ocean are important both nationally and internationally.

9. Revision of Greenland halibut assessment methodology

Arctic fisheries working group (AFWG) over several years recognized the need to facilitate further work on analytical assessment for Greenland halibut. The assessment of the NEA Greenland halibut stock is uncertain due to age-reading problems and lack of contrast in the data. The Inter Benchmark Process on Greenland Halibut in ICES areas I and II (IBPHALI) was set up to follow up the benchmark process for this stock and was completed by correspondence in August 2015. A Gadget model (age-length-structured, tuned only on length data) is used for assessment of this stock.

In June 2017 ICES provided catch advice for Greenland halibut for 2018 and 2019. Further work is needed to monitor and revise what is a new assessment methodology, and establish reference points, harvest control rules and a methodology for estimation of appropriate fishing mortality level. Such work will demand both extension of the Gadget model back to the early 1980s as well as using additional biomass models to explore in particular the effect of high catches in the 1960s and 1970s. Effort and catch data from the 1960s-1980s necessary for this work should be made available by both countries as soon as possible.

In the report from the ICES Inter Benchmark Process on Greenland Halibut in ICES areas I and II (IBPHALI-2015) recognized the need for ageing methodology for this stock. The lack of age data in the model has had limited impact on the assessed biomass, but does negatively impact on modeling recruitment (and hence the ability to produce forecasts). In 2016 the second ICES workshop on age reading of Greenland halibut (WKARGH2) gave ten recommendations on how to implement age readings to assessment, number one being: "While it is recognized that some ageing issues remain to

be resolved, the WKARGH2 recommends that either the frozen whole right otolith or thin-section method can be used to provide age estimates for stock assessments". Effort is presently being made in Norway to increase amount of age data for the NEA Greenland halibut stock using one of these new age reading methods.

10. Research and long term monitoring on benthic organisms

Long term monitoring on benthic organisms on both Russian and Norwegian side of the Barents Sea should be continued. This includes the scientific exchange program between PINRO and IMR in order to standardise processing of trawl samples, species identification and exchange of young scientists.

Russian and Norwegian scientists will continue to contribute to collaborative and international projects within the Joint Russian-Norwegian Environmental Commission, as well as Arctic Council efforts.

Russian and Norwegian scientists will continue investigations of vulnerable habitats and species in the Barents Sea and adjacent waters.

Detailed discussions on future sampling programs for benthic organisms will be undertaken at the March meeting.

11. Determination of conversion factors

Accurate conversion factors are necessary in order to estimate the actual catches of the joint exploited stocks. Varying fishing and processing conditions, such as fishing areas and seasons, length-weight characteristics, fishing gear, technological parameters of raw fish processing including different ways of processing (machine or manual), processing equipment, ways of freezing, packing and storage require continuous investigations. It is necessary to obtain additional data on conversion factors for fish taking into account annual, biological variations and effects of fishing gear and technological processing equipment.

Russia and Norway will continue their investigations on establishing accurate conversion factors for products for Greenland halibut and beaked redfish.

A joint investigation will be carried out in accordance with point 4.2 in the Protocol of the Permanent committee for management and control on the fisheries sector.

In order to determine conversion factors, Russian and Norwegian scientists will collect data onboard commercial vessels. Survey reports will be available for appropriate authorities in Russia and Norway.

12. Development of genetic database for fish species

The further development of joint PINRO/IMR genetic database for Atlantic salmon populations will continue in 2018-2019 and include sampling for farmed salmon escapees in coastal areas and in rivers. The aim of sampling for farmed salmon escapees in rivers is to provide data for quantifying genetic introgression of farmed fish into wild Atlantic salmon populations.

Russian and Norwegian scientists will continue to explore genetic polymorphism and to investigate population structure of several fish species in the Barents Sea. The studies are focused on but not

confined by the cod, capelin, polar cod and the redfish, with the DNA markers for these species to be identified within the next years. The basis for sampling is the surveys conducted by both sides.

For skates and rays it was suggested that IMR and PINRO make a joint effort in collecting samples of all species in the Barents Sea.

13. Monitoring of pollution levels in the Barents Sea

PINRO and IMR will continue to monitor pollution levels in accordance with national programs. Monitoring pollutants is an important task to understand potential impacts on the Barents Sea food web and related food safety. Samples of seawater, sediments and fish will be collected and analysed for organic pollutants and heavy metals.

Parties will continue monitoring of marine litter as in the last years.

14. Monitoring of the hydrochemical conditions in the Barents Sea

Monitoring of the hydrochemical conditions in the Barents Sea will contribute to improving knowledge about the state and variability of the marine ecosystem. It was agreed to continue exchanging results of chemistry analysis of water samples utilizing national institutes.

15. Russian-Norwegian Fisheries Science Symposia

The 18th Russian-Norwegian symposium «Influence of ecosystem changes on harvestable resources at high latitudes» was held 05-07 June 2018 in Murmansk, Russia. The symposium had participation from a wide range of Russian and Norwegian institutions and was considered very successful.

The Organizing Committee of the Symposium consisted of Evgeny Shamray, Andrey Dolgov, Anatoly Filin, Alexander Trofimov from PINRO and Geir Huse, Tore Haug, Maria Fossheim, Jan Erik Stiansen from IMR.

The symposium included five theme sessions:
Theme 1: Oceanography
Theme 2: Plankton composition, distribution and abundance
Theme 3: Benthic distribution and production
Theme 4: Fish communities on the move – food or competitors?
Theme 5: Top predators

The symposium language was English, and Proceedings of the symposium will be published in the IMR/PINRO Joint Report Series. The deadline for submitting contributions to the symposium was 1 October 2018. In addition, authors with good contributions have been invited to submit manuscripts to be published in a special issue of ICES Journal of Marine Science. The deadline for submitting manuscripts is 1 December 2018.

The next symposium will take place in Norway in 2020. The working title of the symposium is "Multispecies management: species interaction, trade-offs and technical interactions". The content, title and main topics of symposium will be discussed during the March meeting in 2019.

16. Exchange program of scientific personnel

It has been agreed that the program for exchange of scientific personal between Russia and Norway on all levels (students – research technicians – senior scientists) will continue. It will be applied for new projects (NRC, MNFA) to continue the exchange program beyond 2018.

A plan for next year will be developed and considered prior to the annual March meeting. The exchange should have first focus on young scientists and scientists for coordination of research programs and methods between the institutions at their laboratories and at their research vessels during investigations, but will also include database and long-term modelling. Scientists will also be invited to take part in surveys onboard research vessels from both institutes.

At the March meeting in 2018, the parties agreed to develop a formal agreement regulating the cooperation covering travel, survey participation, salary during travel, visa applications, etc. in order to allow more flexibility in exchange of personnel for various purposes. The parties agree that agreement should be an appendix to MoU between IMR and PINRO and should be finalise before the end of January 2019.

17. Data exchange

It was agreed to exchange data collected in joint and national scientific surveys and by observers on board of commercial vessels:

- all data collected in joint surveys relevant to stock assessments and environment conditions;
- field data on temperature and salinity in the Barents Sea with 1 m depth interval from oceanographic stations;
- results of hydrochemical analysis obtained during joint surveys in the Barents Sea;
- data on marine litter and pollutions;
- mean length and weight at age as well as maturity at age used in commercial stocks assessments;
- surveys abundance indexes and acoustic data used in commercial stocks assessments;
- stomach content of commercially important species;
- otoliths and scales collected under the program for age validation of bottom and pelagic fish;
- data on plankton and benthic fauna;
- scales and tissue samples collected for further development of joint genetic database for Atlantic salmon;
- data on the biology of seals of the White Sea population (mortality, maturation, size-at-age, feeding data, ice conditions in the White Sea and adjacent waters of the southeastern Barents Sea);
- fisheries statistics for key commercial fish species in ICES Sub-areas 1, 2a, 2b needed for stock assessments of commercial fishes (catches, age composition of catches, mean weights at age in catch).

The above list will be updated during the March meeting. Oceanographic data obtained during surveys need to be exchanged during the survey. If some post processing is required data should be exchanged as soon as possible.

18. Catch volumes needed for investigations of marine resources and monitoring of the most important commercial species, as well as management tasks

The catch volumes shall enable to carry out all tasks described in “Joint Norwegian – Russian Scientific Research Program on Living Marine Resources in 2019” including surveillance activities to provide recommendations on area closures/reopening as well as other decisions on management of fishing activities on living marine resources in ICES Subarea 1 and 2 including respective EEZs of Russia and Norway, international waters (“Loophole”) and Svalbard (Spitsbergen) area.

To solve these tasks the following catch quantities are decided and shall be available in equal parts for both Parties in 2019:

- 14 000 tonnes of cod in addition to volumes mentioned in Appendix 3
- 8 000 tonnes of haddock in addition to volumes mentioned in Appendix 3
- 500 tonnes of capelin in addition to volumes mentioned in Appendix 3
- 1 500 tonnes of Greenland halibut in addition to volumes mentioned in Appendix 3

Both Parties will make all efforts to fulfil the program.

All catches taken for research and management purposes should be recorded in the catch statistics separately.

Under "The Joint Russian – Norwegian Scientific Research Program on Living Marine Resources in 2019" the Norwegian party will grant permission to fish and catch their living marine resources to vessels owned or hired by PINRO or other Russian scientific institutions in the Norwegian Economic Zone and areas around Jan-Mayen in amounts not exceeding:

- 5 000 tonnes of cod
- 3 000 tonnes of haddock
- 250 tonnes of capelin
- 700 tonnes of Greenland halibut

Under "The Joint Russian – Norwegian Scientific Research Program on Living Marine Resources in 2019" the Russian party will grant permission to fish and catch their living marine resources to vessels owned or hired by IMR and other Norwegian scientific institutions in the Exclusive Economic Zone of the Russian Federation in amounts not exceeding:

- 5 000 tonnes of cod
- 3 000 tonnes of haddock
- 250 tonnes of capelin
- 700 tonnes of Greenland halibut