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Roadmap for ICES activities in 2015, 2016 (ICES Secretariat, HoS)

Objective of ICES engagement in the Arctic science arena: establish ICES as key partner with Arctic organizations of strategic importance.

The ICES Arctic Fisheries Working Group made recommendations in 2013 that were revisited by the Council Working Group on Maritime Transatlantic Cooperation in 2015.

1. Support existing Working Groups to monitor and assess expanding ranges of living resources into the Arctic (recommendation of AFWG).

2. Expand the existing "ecology" Working Groups from their geographical remits into ice-free, open waters of the Arctic (zooplankton, benthos but also WGOH etc.) (recommendation of AFWG).

3. Establish a working group on integrated Assessment on the Arctic or allow existing working groups on integrated assessment develop into such.

4. Establish a survey-planning group (or expand the mandate of an existing group) for the Arctic waters that could coordinate existing surveys and identify gaps and survey needs (recommendation of AFWG).

5. Expand data services with special emphasis on the Arctic Ocean.

6. Be proactive in designing conservation measures, e.g. investigating the appropriateness and dimension of Arctic MPAs.

7. Produce a comprehensive leaflet that explains to the public and politicians ICES competences and achievements in the Arctic. It should present the results of the assessments and its science and based on this, demonstrate the need for scientific expansion.

Since these recommendations were made, ICES has made good progress towards building working relationships and trust with the Arctic actors in the science arena. Further work is needed and further strategic cooperation with Arctic organizations should be the main priority in order to contribute ICES competence and avoid duplication of effort.

Potential Strategic action: Host an arctic themed workshop to review ongoing activities (including surveys), identify gaps, building up to an Arctic dialogue meeting in 2016 to meet and discuss with strategic partners on areas for further cooperation, and specific contributions by ICES.

Mapping existing and potential cooperation with Arctic organizations

Arctic Council – Arctic Marine Strategic Plan (AMSP)

Arctic Organizations	ICES Action
The International Arctic Science Committee	
April 23-30, 2015, Toyama, Japan: The ICARP III conference and the (IASC) Arctic Science Summit Week (ASSW) Establish research priorities for future research in the Arctic, including social and life sciences (but not fisheries) and involving the local communities (not the industry), and to review ongoing observational systems	ICES will continue as partner of IASC and be part of ICARP.
The coastal states to the Central Arctic Ocean: Meetings of Scientific Experts on Fish Stocks in the Central Arctic Ocean	
March 14-16, 2015, Seattle, USA: 3rd Meeting of Scientific Experts on Fish Stocks in the Central Arctic Ocean Review current programs for fish-relevant research and monitoring (R&M) in the central Arctic Ocean and adjacent shelf areas, to report status of R&M, addressing gaps in knowledge on the distribution and abundance of fish in the central Arctic Ocean, and develop a framework for a Joint Program of Scientific Research and Monitoring for the central Arctic Ocean region;	ICES as model for inventory of research and monitoring in the CAO; ICES recognized as only organization that currently has a formal, advisory role in relation to management authorities; P/ICES-IOC Effects of Climate Change on the World's Oceans Scientific Symposia series as high-profile authority on topic

Arctic Council	
21-22 September 2015, Oslo, Norway: Arctic Council's Task Force on Arctic Marine Cooperation (TFAMC) Assess future needs for a regional seas program for increased cooperation in Arctic marine areas, and to acknowledge the importance of scientific cooperation to the circumpolar region, note the work on enhancing scientific cooperation in the Arctic, and decide to extend the Task Force mandate, including to work towards a legally-binding agreement on scientific cooperation, with a view to completing its work no later than the next Ministerial meeting (2017);	Moved ICES into the front row of cooperating organizations in the Arctic marine science arena.

Arctic Council AMSP Strategic Action At the Arctic Council Ministerial meeting in 2015 a new AMSP[1] was approved. The strategic actions identified in the AMSP will guide the work of the Arctic Council and its subsidiary bodies in the coming decade. The ICES Strategic Plan 2014–2018 identifies the Arctic as a strategic action area. In order to ensure that ICES activities are linked to the AMSP, the table below has been compiled to show where AMSP strategic actions (only relevant actions for ICES have been included) could be complemented with existing ICES work.	**Relevant ICES competence**
7.1 Improve and Expand the Knowledge-base	
7.1.1 Strengthen scientific cooperation and joint monitoring among the Arctic states, and with other states, organizations and stakeholders involved in Arctic research or traditional and local knowledge, with a focus on prioritizing research issues, filling knowledge gaps, and developing mechanisms to share and exchange observational data.	All Arctic states are also members of ICES. ICES has extensive experience coordinating joint monitoring. Science Steering Group on Integrated Ecosystem Observation & Monitoring (SSGIEOM). ICES will actively contribute to the preparation of the next CAFF CBMP Arctic Marine Biodiversity Report (planning group in November 2015).
7.1.2 Improve, synthesize, and respond to emerging knowledge across all disciplines and sectors to include government, academic and industry information, and traditional and local knowledge.	ICES advisory services focus on synthesising existing and new knowledge in order to provide the best possible advice. This is best known in the fisheries field but also encompasses ecosystem advice, and advice relevant to all human maritime activities.

1 http://www.pame.is/index.php/projects/arctic-marine-strategic-plan

7.1.3 Improve the understanding of cumulative impacts on marine ecosystems from multiple human activity-induced stressors such as climate change, ocean acidification, local and long range transported pollution (land and sea-based), marine litter, noise, eutrophication, biomass overharvesting, invasive alien species and other threats.	ICES is committed to developing integrated ecosystem understanding. (http://ices.dk/explore-us/Action%20Areas/Pages/Integrated-ecosystem-assessments.aspx) IEAs are a natural progression in the ecosystem approach to marine management. ICES IEA groups are working to update ecosystem overviews in several regions. These overviews will feature ecosystem descriptions combined with long-term species trends and long-term trends in drivers of ecosystem change such as climate, oceanography, and fishing pressure. Relevant ICES Working Groups (Arctic Fisheries, IEA of the Norwegian Sea and of the Barents Sea, as well as ICES/AMAP/CAFF/PAME WG on Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean). ICES has advised on climate change, ocean acidification, eutrophication, avoidance of biomass over-harvesting and invasive alien/non-indigenous species.
7.1.4 Improve the predictive capacity and develop a common understanding of the likely future impacts of climate change and other emerging threats, such as ocean acidification.	Potential to assist with: Monitoring guidelines (climate, environment, oceanography), cf the joint ICES-OSPAR Ocean Acidification Study Group (hhttp://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2014/SGOA/sgoa_2014.pdf). Publishing of Series of ICES Survey Protocols (SISP). Quality assurance guidance and exercises

	Assessment frameworks (Contaminants, ocean acidification) Guidance on statistical analysis of environmental data Data management (contaminants, biological effects, oceanography) A joint ICES/AMAP Ocean Acidification group is being developed with marine chemistry and plankton as focus themes. The group will be supported by existing ICES working groups on Marine Chemistry, Phytoplankton Microbial Ecology, and Zooplankton Ecology. 2013 Conference on "Acidification of the Arctic Ocean and Northern Seas: Trends and Consequences", 6-8 May 2013, at Bergen, Norway with the Arctic Council's Arctic Monitoring and Assessment Programme (AMAP) and ICES as Conveners The Strategic Initiative on Climate Change Impacts on Marine Ecosystems (SICCME) is a mechanism set up by ICES and PICES to coordinate northern hemisphere efforts to understand, estimate and predict the impacts of climate change on marine ecosystems.
7.1.6 Improve and coordinate communication of knowledge generated in Arctic Council assessments to the circumpolar and global community.	Potential to cooperate on some outreach activities for maximum impact.
7.1.7 Continue the development and standardizing of data sharing and management at a circumpolar level.	ICES Data Centre is an experienced leader in the development and standardization of marine data sharing and management at a regional and international level. The Data Centre has an established relationship with the Arctic Monitoring and Assessment Programme (AMAP) and has a representative from the ICES network on the SAON Committee on Data and Information Services (CDIS).

7.1.8 Improve awareness of Arctic shipping activity and its impacts, promote expanded information sharing of ship traffic data among Arctic states and, as appropriate, other stakeholders, and update selected parts of the 2009 Arctic Marine Shipping Assessment (AMSA) Report, including those pertaining to the volume, composition and destination of Arctic shipping, shipping impacts, and key infrastructure needs such as hydrographic surveying and nautical charting.	ICES has an Expert Group on Risks of Maritime Activities in the Baltic Sea (WGMABS) which could consider taking into account the Arctic Ocean and shipping activities. A request to ICES to contribute to the respective work of the Working Group on Risk Assessment (EPPR) was made by Arctic Council in 2014.
7.1.9 Strengthen, where feasible, the collection, observation, monitoring and dissemination of relevant data on the Arctic marine environment. This could include hydrographic and bathymetric data; oceanographic data (including tides and currents) and meteorological information for numerical modeling and forecasting; pollutants; climate change-related impacts (especially ocean acidification); and ecosystem and biodiversity status and trends (including invasive species and other metrics of environmental change).	The annual ICES Report on Ocean Climate (IROC) and the ICES Zooplankton Report covers subarctic waters. ICES data centre already holds much data in these areas and is geared for further collection and is developing mechanisms to display and extract those data.
7.1.11 Support continued development of circumpolar indicators of changes and stressors across the Arctic marine environment, as well as metrics for monitoring biodiversity.	ICES working groups (e.g. Working Group on Ecosystem Effects of Fishing Activities WGECO) and ICES advisory services have a long experience of developing indicators – most recently for the EU's Marine Strategy Framework Directive. The AORAC-SA project has links through to the International North Atlantic-Arctic Science Plan of the USA National Science Foundation to the study of ocean stressors.
7.2 Conserve and Protect Ecosystem Function and Biodiversity	Steering Group On Ecosystem Processes And Dynamics (SSGEPD)

7.2.1 Promote the implementation of the ecosystem approach to management in the Arctic through synthesis and application of the results of relevant work by the Arctic Council and associated efforts by relevant organizations.	ICES is already engaged in implementing the ecosystem approach and would be happy to be associated with this initiative. Cooperation with the Arctic Council to develop an integrated ecosystem assessment for the central Arctic Ocean through the work of WKICA/WGICA is on-going.
7.2.2 Identify and assess threats and impacts to areas of heightened ecological and cultural significance and how such areas may be influenced in the future by climate change and other human induced changes and activities.	ICES has already advised on the effects of climate change on areas of ecological significance.
7.2.3 Identify and develop tools and methodologies for assessing cumulative impacts and risks for Arctic marine ecosystems and areas of heightened ecological and cultural significance with the aim of using them for integrated assessments.	ICES Working Group on Marine Habitat Mapping (WGMHM) coordinates the review of habitat classification and mapping activities in the ICES area and promotes standardization of approaches and techniques. The experts in WGMHM have experience in habitat mapping and classification, and include geologists, benthic ecologists, conservation practitioners, GIS analysts and database experts. The working group meets annually to collate new information and standardize geographic information for seabed and habitat maps the in the ICES area. http://www.ices.dk/community/groups/Pages/WGMHM.aspx This information has been used in ICES advisory processes, with further development of ways of assessing cumulative impact planned for 2016.
7.2.4 Encourage the Arctic states to implement appropriate measures, – or to pursue such measures at relevant international organizations to protect Arctic marine Areas of Heightened Ecological and Cultural Significance. Focus	**Potential to assist with**: Monitoring guidelines (climate, environment, oceanography)

should be on species and ecosystems particularly at risk from climate change and cumulative impacts, including areas of refuge for ice-associated species that are, or are expected to become particularly important to Arctic marine biodiversity under future climate conditions.	Quality assurance guidance and exercises Assessment frameworks (Contaminants, ocean acidification) Guidance on statistical analysis of environmental data Data management (contaminants, biological effects, oceanography) Letter of understanding under discussion between AMAP and ICES secretariats based on: -Reporting of Arctic marine data to the ICES dataset collection; and -Assessment tools for the AMAP programme. **Existing**: ICES currently operates the Arctic Monitoring and Assessment Programme thematic Data Centre for environmental data gathered by the Arctic countries and observing countries
7.2.5 Develop and encourage the Arctic states to implement common measures and support research into technology and techniques for early detection and reporting of marine invasive species in the Arctic marine environment.	Working Group on Introductions and Transfers of Marine Organisms (WGITMO) and ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV) are already dealing with bioinvasions in the Arctic, but in rather limited amount. It has been suggested that ICES and PAME arrange a workshop and discuss, and agree on the joint interests and design follow-up activities. WGBOSV has Arctic-related ToR for 2016-2018: Investigate and evaluate climate change impacts on the establishment and spread of ship-mediated nonindigenous species, particularly with respect to the Arctic.

7.2.6 Identify and map areas of the marine environment that are particularly vulnerable to the effects of ocean acidification to inform appropriate monitoring and adaptation measures.	The Working Group on Deep-water Ecology (WGDEC) is a joint ICES/NAFO expert group that deals with the biology and conservation of deep-sea habitats in the North Atlantic. WGDEC experts are comprised of taxonomic specialists, deep-sea survey scientists, GIS analysts, fisheries scientists, database experts, benthic ecologists, and fish biologists, and they meet annually to collate new information and map the distributions of vulnerable marine systems (VMEs) in ICES and NAFO areas. The resulting maps are combined with information on bathymetry and fishing activity to assess the risk to VMEs. In some situations closures to bottom fisheries are the best means of affording protection, and WGDEC uses the best available data on VME distribution, models, bathymetric maps and the judgement of experts to suggest appropriate closure boundaries. The working group also advises on the appropriateness of the bottom fishing regulations adopted by RFMOs as well as wider ecological questions regarding deep-sea ecosystem function and diversity.
7.2.7 Promote cooperation among Arctic and non-Arctic states to address threats to the staging and wintering grounds and migrating corridors of migratory species using the marine environment.	Existing ICES Expert groups could provide the scientific information for identifying such threats (e.g. Arctic Fisheries Working Group; Joint ICES OSPAR working group on seabirds; Working Group on Marine Mammal Ecology).
7.2.10 Develop a pan-Arctic network of marine protected areas, based on the best available knowledge, to strengthen marine ecosystem resilience and contribute to human wellbeing, including traditional ways of life.	ICES has extensive experience in developing marine protected area guidelines and facilitating stakeholder workshops. As a transatlantic network ICES has the competence and the infrastructure to evaluate the effectiveness of MPAs. It could therefore be of considerable assistance for PAME.

7.3 Promote Safe and Sustainable Marine Resource Use	
7.3.1 Advance EBM as an overarching framework for conservation and sustainable use of living and non-living resources in the Arctic marine environment, taking into account cumulative impacts on the Arctic and the need for adaptation to climate change.	The Working Group on Multispecies Assessment Methods (WGSAM) Terms of Reference (ToRs) aims at enabling research on predator-prey interactions for developing advice on the ecosystem approach to fisheries management. The ICES Working Group of Small Pelagic Fishes, their Ecosystems and Climate Impact (WGSPEC) encourages and gathers cross-disciplinary experts to look at the linkages between small pelagic fish and climate impacts.
7.3.8 Promote the management of human activities in the circumpolar Arctic in accordance with Ecosystem Based Management and international law to ensure long term sustainability of stocks and ecosystems.	Arctic Fisheries Working Group (AFWG) performs assessments of cod, haddock, saithe, redfish, Greenland halibut, and capelin stocks in ICES areas I and II (Barents Sea and Norwegian Sea) and on its surveys and data sampling going as far north as the ice coverage allow.
7.3.11 Promote cooperation to improve and expand a) hydrographic and bathymetric data collection and b) Safety of Navigation services and products (including nautical chart and publication production) to support safe and efficient marine shipping in the Arctic.	ICES Working Group on Oceanic Hydrography (WGOH) closely monitors the ocean conditions in the ICES area by updating and reviewing results from standard hydrographic sections and stations. The material presented at the WGOH meetings each year is consolidated and published as the annual ICES Report on Ocean Climate (IROC).

2016 ICES Activities		
Event/meeting	**Objective**	**Impact**
2016, tbd, ICES/CAFF/PAME Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA)	In collaboration with Arctic Council working groups consider the approach and methodologies for doing an IEA, and begin assembly of data and information building from the Inventory of Arctic Research and Monitoring (IARM).	Intensify cooperation with Arctic Council Working Groups, prepare the ground for IEA in the CAO future IEA in cooperation with Arctic Council, including the CAO.
2015 ICES Activities		
March 14-16, 2015, Seattle, USA: 3rd Meeting of Scientific Experts on Fish Stocks in the Central Arctic Ocean	Review current programs for fish-relevant research and monitoring (R&M) in the central Arctic Ocean and adjacent shelf areas, to report status of R&M, addressing gaps in knowledge on the distribution and abundance of fish in the central Arctic Ocean, and develop a framework for a Joint Program of Scientific Research and Monitoring for the central Arctic Ocean region;	ICES as model for inventory of research and monitoring in the CAO; ICES recognized as only organization that currently has a formal, advisory role in relation to management authorities; P/ICES-IOC Effects of Climate Change on the World's Oceans Scientific Symposia series as high-profile authority on topic
April 23-30, 2015, Toyama, Japan: The ICARP III conference and the (IASC) Arctic Science Summit Week (ASSW)	Establish research priorities for future research in the Arctic, including social and life sciences (but not fisheries) and	ICES visibility as convener of theme sessions on fisheries and shipping, and on communication of science.

	involving the local communities (not the industry), and to review ongoing observational systems (continue the role of ICES as partner of IASC and be part of ICARP);	
May 28-29, 2015 in Bergen, Norway: The ICES/AMAP/PAME/CAFF Workshop on Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean (WKICA)	Consider the purpose and scope of an Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean, review the data and information available from past and on-going monitoring and research relevant for IEA, consider the geographical scope for a Central Arctic Ocean IEA, in particular the relationships to the 'up-stream' Atlantic gateways, consider the thematic scope of an IEA, e.g. impacts from climate variability and change, contaminants and pollution, shipping, and fisheries, and suggest practical steps for initiating and carrying out an IEA for the Central Arctic Ocean; WKICA recommended an Expert Group to continue;	Established ICES as the authority on IEA in the Arctic science arena, established or reinforced cooperation links with Arctic Council Working Groups.
3-5 November, 2015, Pasvik, Norway, CBMP – marine annual face-to-face meeting	Expand the cooperation within the framework of the Circumpolar Biodiversity Monitoring Programme especially in its marine component and to liaise with other organizations, include ICES in view of its	Will greatly enhance cooperation with CBMP and consolidate ICES as authority on IEA.

	ecosystem observation and assessment capacities;	

Annex: For Input to the Arctic Council:

The Arctic Council Strategic Plan

ICES as a knowledge provider with a diverse science portfolio will be able to contribute to the Arctic Council Strategic Plan to:

- Improve knowledge of the Arctic marine environment, and continue to monitor and assess current and future impacts on Arctic marine ecosystems (goal 1),
- provide knowledge to help conserve and protect ecosystem function and marine biodiversity to enhance resilience and the provision of ecosystem services (goal 2),
- provide knowledge to promote safe and sustainable use of the marine environment, taking into account cumulative environmental impacts (goal 3),
- help enhance the economic, social and cultural well-being of Arctic inhabitants, including Arctic indigenous peoples and strengthen their capacity to adapt to changes in the Arctic marine environment (goal 4).

A number of factors point to the importance of ICES as a scientific knowledge provider in the Arctic;

- the existing scientific network, including data and information products, and advisory functions, involving all Arctic Member States;
- current cooperation with the Arctic Council, and its working groups, including;
- the recent initiative to establish the joint CAFF (Conservation Arctic Fauna and Flora).

PAME (Protection of Arctic Marine Environment), and ICES Expert Working Group on the development of an Integrated Ecosystem Assessment for the Central Arctic Ocean.

ICES data services in relation to the Arctic: ICES provides the core evidence base for marine assessments in the ICES area; for example, the Contaminants and Biological Effects dataset is closely related to the AMAP monitoring and assessment programme. This includes potential further cooperation on a hazardous substances assessment tool, generating on demand a dataset product from the ICES databases, as is demonstrated by the OSPAR assessment tool.

For more than a decade ICES has produced a report from the ICES Area of the North Atlantic and Nordic seas describing the state and trends in ocean climate. More recently, this comprehensive report has been available as an operational data tool from the ICES website. http://www.ices.dk/newsandevents/newsarchive/news/Pages/Climate-report-enters-the-digital-age.aspx.