

Council Working Group Maritime Trans-Atlantic Cooperation

Cornelius Hammer will update the meeting on progress and next steps of the Council Working Group on Maritime Trans-Atlantic Cooperation.

ICES Council

Cornelius Hammer

Report of the Council Working Group on Maritime Transatlantic Cooperation (CWGMTC)

23–24 April 2014

Copenhagen

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Recommended format for purposes of citation:

ICES. 2014. Report of the Council Working Group on Maritime Transatlantic Cooperation (CWGMTC), 23-24 April, Copenhagen. Cornelius Hammer. 74 pp.

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Working Group Members and Invited Guests

Manuela **Azevedo** (Portugal)

Anne Christine **Brusendorff** (ICES Secretariat; attended meeting)

Paul **Connolly** (President)

David **Gillis** (Canada)

Sieglinde **Gruber** (EU DG Research & Innovation; invited guest)

Cornelius **Hammer** (Germany, Chair; attended meeting)

Maurice **Heral** (France; attended meeting)

Fritz Köster (Denmark; attended meeting)

Steve **Murawski** (United States of America)

Niall Ó Maoiléidigh (Ireland; attended meeting)

Tore **Nepstad** (Norway)

Carmella **Porteiro** (Spain)

Bill **Turrell** (United Kingdom)

Preamble

The ICES Strategic Plan (2014–2018) commits to building a foundation of science around one key challenge: integrated ecosystem understanding. Integration and collaboration are required to overcome scientific fragmentation and address the complexity and the dimensions of the challenge. The complexity of marine ecosystems and their physical processes make multidisciplinary and collaborative research mandatory. Governments must effectively draw on existing expertise, wherever it resides. The first step is to support scientific cooperation on various levels, i.e., the national, international, thematic and conceptual, programmatic, and project levels.

Throughout previous decades, international collaboration was an integral and important element in the European Commission's research framework programmes¹. This collaborative aspect was significantly strengthened in the Horizon 2020 research initiative (H2020), which commenced on January 2014.

In the 7th Framework Programme 2007–2013, consortium members outside of Europe accounted for 5,500 projects and 5% of the total participation. Funding for these projects amounted to about 2% of the total programme budget. One in five projects included an international partner².

Under Horizon 2020, the European commission emphasized its new and widely strengthened approach to international cooperation, recognizing that many international partner countries are investing more and more in research and innovation, and that cooperation is vital if research is to reach its full potential. An active and more strategic international cooperation will also contribute to achieving the EU's wider policy objectives³.

Transatlantic cooperation embraces a diverse array of industrial and scientific fields. Transatlantic collaborative research on biotechnology was initiated in 1990 via an EU–US Task Force, aimed at facilitating scientific discussions and the exchange of ideas between and within the EU and US.⁴

In the fields of oceanography, marine biology, fisheries science, and resource management, transatlantic cooperation has flourished since the establishment of ICES in 1902. The ongoing work of ICES is proof that highly productive and fruitful transatlantic research collaboration is alive and well. In the context of H2020, the strengths of ICES are ideally suited to further enhance and catalyze international research cooperation.

As in previous EC research programmes, H2020 will be open to participation from across the world. This openness is complemented by targeted actions in specific areas and with specific partner countries and regions, based on the principle of common interest and mutual benefit.

1 Council of the European Union 16763/08 Council conclusions concerning a European partnership for international scientific and technological cooperation. 16017/08 RECH 381 COMPET 504 RELEX 938 DEVGEN 243

2 University World News Global Edition, Issue 229, 06.12.2013
<http://www.universityworldnews.com/article.php?story=20131205141304240>

3 http://ec.europa.eu/research/horizon2020/pdf/press/fact_sheet_on_international_participation_in_horizon_2020.pdf

4 Aguilar, A., Bochereau, L. and Matthiessen-Guyader, L. (2008) Biotechnology and sustainability: the role of transatlantic cooperation in research and innovation. Trends in Biotechnology, 26(4): 163-165.

Transatlantic cooperation is a part of an overall approach by the European Commission emphasizing the development of the Transatlantic Research Alliance, particularly with Canada and the USA. The transatlantic research alliance can be further developed now that the Galway Statement has provided a formal basis for this cooperation. The Commission has indicated⁵ that a stock-taking exercise focusing on the most promising areas for cooperation needs to be conducted before subsequent collaborative activities can take place. The Commission has asked Member States to consider what steps can be taken to engage international partners in the phased development of the Atlantic Strategy⁶. Implementing the objectives of the Commission will depend to a large extent on the public sector, where ICES plays a major role and where ICES currently facilitates and fosters cooperation across the Atlantic area.⁷

The overall purpose of the ICES Council Working Group on Transatlantic Maritime Cooperation is to describe how ICES could be used to facilitate and promote work under transatlantic cooperative agreements and initiatives (such as the H2020, the Galway Statement, and the EU Maritime Strategy for the Atlantic Ocean area). It is not however intended to fully summarize the initiatives on the EU-level to develop common research agendas. This is done on different organizational levels such as projects (e.g. SEAS-ERA⁸, European Marine Board⁹, Joint Programming Initiative (JPI) ¹⁰).

As a result of the Galway Declaration, EU transatlantic participation with Canada and the USA is prioritized in at least seven of the upcoming calls for proposals under the EU's Blue Growth agenda. The Blue Growth agenda is part of the Horizon 2020 Work Programme titled: Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bio-economy.

⁵ COM(2013) 279, p.12

⁶ *ibid* p.12

⁷ *ibid*, p.11

⁸ SEASERA: Towards integrated European marine research strategy and programmes. <http://www.seas-era.eu>

⁹ European Marine Board (2013) Navigating the Future IV, Position Paper: <http://www.marineboard.eu/images/publications/Navigatingthefuture-IV-168.pdf>

¹⁰ JPI: The establishment of the Joint Programming Initiative (JPI) Healthy and Productive Seas and Oceans. www.jpi-oceans.eu

Summary

The prime objective of the ICES Council Working Group on Transatlantic Maritime Cooperation is to describe how ICES could be used to facilitate and promote work under transatlantic cooperative agreements and initiatives (such as the H2020, the Galway Statement, and the EU Maritime Strategy for the Atlantic Ocean area). Moreover, it is the purpose of this document to describe the main elements of current maritime transatlantic cooperation (ToR 1), to list what the ICES member states already contribute to the transatlantic cooperation (ToR 2), to show what ICES as an organization contributes to this by its work (ToR 3) and finally to identify new opportunities for transatlantic cooperation (ToR 4). The response to this is comprehensively summarized in Annex 1.

The European *Action Plan for the North Atlantic* highlights four Priority Areas to which ICES contributes directly to **Priority 1** (*Supporting CFP*) in many ways: Design and evaluation of management plans, modelling of different management scenarios, working groups on gear research, estimating discard, developing options for discard avoidance, and the environmental impact of aquaculture to name a few.

With regard to **Priority 2** (*Protect, secure, and develop the potential of Atlantic marine and coastal environments*) ICES runs a large database on Atlantic Data and has a number of working and study groups on Global Climate Change. ICES conducts working groups on Integrated Assessments and Ecosystem Based Management and has projects on fisheries management in Marine Protected Areas, all to support the MSFD and the CFP as well. Moreover, ICES has working groups on Ecosystem Understanding, Biodiversity of the Seas, Marine Spatial Planning, and Integrated Coastal Zone Management.

One of the main aims of the *Galway Statement on Atlantic Ocean Cooperation* is to align research funding on a transatlantic scale. It is shown here that ICES is an established Intergovernmental Organization, based on a legal mandate, the 1964 Convention for the International Council for the Exploration of the Sea (1964 Convention), which through its membership¹¹ has a permanent trans-Atlantic focus and working style.

One of the main aims of ICES is to collate, coordinate, and jointly work on identified trans-Atlantic research priorities as well as promote and disseminate outcomes of such joint research activities. To help connect and make use of the ICES network DG Research & Innovation is encouraged to make use of ICES national contact information for the main players to help activate action to align research funding through the relevant government agencies (i.e. NOAA and DFO).

The *Transatlantic Ocean Research Alliance* referred to in the Galway Statement is, amongst others, comprised of bilateral working groups (the US – EU Science and technology joint consultative group, and the Canada – EU Science and technology joint coordinating committee) and thematic working groups (on marine and the Arctic), but membership is open to all those who

¹¹ Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Russian Federation, Spain, Sweden, United Kingdom, and the United States of America.

can agree with the Galway Statement. ICES now links in with US and Canada to be included in the bilateral groups of the Transatlantic Research Alliance.

Terms of Reference

Mandate of the Council Working Group on Maritime Transatlantic Cooperation (CWGMTC)

The CWGMTC shall work by correspondence and hold one meeting in Copenhagen in April 2014. The main objective of the Group shall be to develop a discussion paper for consideration at the October 2014 Council meeting on Maritime Transatlantic Cooperation. The Group will be chaired by the ICES First-Vice President Cornelius Hammer and membership of the group will be drawn from those delegates who have an interest in developing an ICES position on this issue (the following countries have volunteered to participate: Canada, Denmark, France, Ireland, Netherlands, Norway, Spain, Portugal, United Kingdom, and the United States). The draft paper shall be presented to Bureau in June 2014 for further discussion and a final paper will be presented to Council in October 2014.

ToR 1.

To summarize the main elements of the EU Maritime Strategy for the Atlantic Ocean Area and the subsequent Action Plan for the Maritime Strategy in the Atlantic Area, transatlantic cooperation agreements and initiatives (an example of the latter; the Galway Statement on Atlantic Ocean Cooperation), bilateral cooperation agreements, and any other relevant Atlantic research and cooperation agreements.

ToR 2.

To summarise existing ICES work and other relevant work carried out by ICES Member Countries in the area of maritime transatlantic cooperation, by reference to the agreements and initiatives summarised under ToR 1.

ToR 3.

To describe how the ICES cooperation structure could be used to facilitate and promote work under transatlantic cooperation agreements using the outputs from ToRs 1 and 2, including ICES position in relation to Horizon 2020 calls (e.g., BG-14-2014 “Supporting cooperation initiatives: Atlantic Ocean Cooperation Research Alliance”).

ToR 4.

To identify new opportunities for trans-Atlantic marine science and research, that ICES could engage in to support the implementation of the ICES Strategic Plan, through the ICES network (expert groups, projects, databases, etc.), or by fostering strategic partnerships.

ToR 1

It is the task to: summarize the main elements of the EU Maritime Strategy for the Atlantic Ocean Area and the subsequent Action Plan for the Maritime Strategy in the Atlantic Area, transatlantic cooperation agreements and initiatives (an example of the latter; the Galway Statement on Atlantic Ocean Cooperation), bilateral cooperation agreements, and any other relevant Atlantic research and cooperation agreements.

<p>Priority Areas (as identified by the EU Atlantic Ocean Strategy/Action Plan, the Galway statement and EU US bilateral discussions; These are the commonalities identified from first mapping exercise)</p>	<p>ICES</p>	<p>Horizon 2020, calls from the 2014-15 work programme relevant to ICES (of which ICES has been approached in some cases)</p>	
<p>Networking and co-operative research</p>	<p>ICES is a 100 year old trans-Atlantic partnership that can offer an established platform with a proven ability to facilitate trans-Atlantic cooperation.</p> <p>ICES has a legal foundation, the 1964 Convention for the International Council for the Exploration of the Sea, and the 2002 Copenhagen Declaration on future ICES strategy, adhered to by the 20 Member Countries; Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, the Russian Federation, Spain, Sweden, United Kingdom, and the United States of America</p> <p>The core of our work is done by nearly 150 Expert Groups composed of nationally nominated experts. Expert group members work throughout the year and normally</p>	<p>BG-14-2014: international initiatives: Atlantic Ocean Cooperation Research Alliance Submission deadline: single stage 26 June 2014.</p> <p>Canada made a statement of support on ICES participation in project of H2020, and specifically on projects related to transatlantic cooperation: "Canada supports Trans-Atlantic Cooperation activities</p>	<p>Supporting cooperation Atlantic Ocean Cooperation Research Alliance Submission deadline: single stage 26 June 2014.</p> <p>The USA made a statement of support on ICES participation in project of H2020, and specifically on projects related to transatlantic cooperation: "The U.S. supports Transatlantic Cooperation activities</p>

	<p>meet annually or bi-annually Search our http://www.ices.dk/community/groups/Pages/default.aspx</p>	<p>working groups:</p>	<p>including the involvement of participants, such as the International Council for the Exploration of the Sea (ICES), in the EU Horizon 2020 research project BG-14-2014 (Supporting international cooperation initiatives: Atlantic Ocean Cooperation Research Alliance)."</p> <p>Dave Gillis - Assistant Deputy Minister Ecosystem and Oceans Science</p>	<p>including the involvement of participants, such as the International Council for the Exploration of the Sea (ICES), in the EU Horizon 2020 research project BG-14-2014 (Supporting international cooperation initiatives: Atlantic Ocean Cooperation Research Alliance)."</p> <p>Fred Serchuk - Senior Science Advisor at the NMFS Northeast Fisheries Science Center</p>
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<p>Ecosystem Approach (invasive species; Good environmental status; Ocean Stressors)</p>	<p>The ICES Strategic Plan commits to building a foundation of science around one key challenge; integrated ecosystem understanding as a way to achieve the ecosystem approach. ICES will continue to produce integrated ecosystem assessments in regional seas as a fundamental link between ecosystem science and the advice required in applying the ecosystem approach. ICES has a number of working groups working in one unified programme in the North Atlantic to develop the science needed for regional management. Specifically four working groups look to the Atlantic ocean: the Working Group on the Northwest Atlantic Regional Sea (based in the USA and Canada), the Working Group on Ecosystem Assessment of Western European Shelf Seas; Working Group on the Integrated Assessments of the Barents Sea; Working Group on the Integrated Assessments of the Norwegian Sea.</p> <p>ICES has existing trans-Atlantic working groups on alien and invasive species and ballast water (WGITMO /WGBOSV; http://www.ices.dk/community/groups/Pages/WGITMO.aspx; http://www.ices.dk/community/groups/Pages/WGBOSV.aspx) that are developing the science to manage the environmental risks.</p> <p>ICES is, with a trans-Atlantic approach, working to define and make operational the notion of Good Environmental Status (GES) as defined in the EU Marine Strategy Framework Directive (EU MSFD), and similar to ecosystem-based management in the Canadian Oceans Act and the USA National Oceans Policy.</p> <p>(http://www.ices.dk/explore-us/Action%20Areas/Pages/Marine-Strategy-Framework-Directive-%28MSFD%29.aspx)</p>	<p>SC5-06-2014: Biodiversity and ecosystem services: drivers of change and causalities (ICES approached) Submission deadline: 1st stage 8 April 2014</p> <p>SC5-7-2015: More effective ecosystem restoration in the EU submission deadline, 1st stage: 16 October 2014</p> <p>SC5-9-2014: Consolidating the European Research Area on biodiversity and ecosystem services (Deadline: 2014-04-08)</p> <p>SC5-10-2014/2015: Coordinating and supporting research and innovation for the management of natural resources (Deadline: component A - 2014-04-08; component C - 2015-03-10)</p>
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	<p>This work ranges from:</p> <ul style="list-style-type: none"> - providing advice to international organizations on criteria and methods to define GES, - providing advice on specific indicators, such as commercial exploited fish, fisheries environmental interactions, food webs, biodiversity and alien species - participating in projects, to develop the science basis for the further work on GES, and ensuring the linkages to the established Expert Working Group structure in ICES - promoting the scientific foundation for integrated ecosystem understanding, and ensuring its contribution and linkage to integrated advice, - promoting the advancement of data and information service for the ecosystem approach/EU MSFD (such as an ICES ecosystem data portal, operationalising data products and expanding areas of dataset collections, including marine litter, bycatch; sea birds and marine mammals, as well as anthropogenic noise) 	
<p>Fisheries and Aquaculture (multispecies long-term plans; By-catch, discards)</p>	<p>ICES is the fisheries advisory for the northeast Atlantic providing advice on 240 stocks annually to international organizations and Member Countries. ICES works with FAO, NAFO, NASCO, DFO, and NOAA to develop international standards for fish stock assessments and the evaluation of long term management plans.</p> <p>ICES is developing methods to provide advice on options for multispecies and mixed fisheries and is moving towards integrated advice. This work is supported through various ICES scientific expert working groups from Europe and North America as well as ICES databases.</p> <p>(http://www.ices.dk/community/advisory-process/Pages/default.aspx)</p>	<p>SFS9-2014: Towards a gradual elimination of discards in European fisheries (first and second call: 2014-03-12/2014-06-26)</p> <p>SFS10-2014/15: Tackling disease related challenges and threats faced by European farmed aquatic animals fisheries (first and second call: March 2014; Feb 2015, fisheries /first and</p>

	<p>ICES has been working on aquaculture issues for decades, in 2013 Aquaculture was identified as a priority area for ICES. ICES Working Group on Aquaculture (WGAQUA) is now the focal point for aquaculture-environment interactions and is responsible to address advisory and science requests related to the sustainability of aquaculture farming practices.</p>	<p>second call: June 2014; June 2015) Submission deadline, 1st stage: 12 March 2014</p> <p>SFS11-2014/15: Implementation of an Ecosystem-based approach for European aquaculture (first and second call: March 2014; Feb 2015, fisheries /first and second call: June 2014; June 2015) Submission deadline, 1st stage: 12 March 2014</p> <p>SFS12-2014: Assessing the health risks of combined human exposure to multiple food-related toxic substances (first and second call: 2014-03-12, 2014-06-29)</p> <p>SFS15-2014: Proteins of the Future (first and second call: 2014-03-12/2014-06-30)</p> <p>SFS17-2014: Innovative solutions for sustainable novel food processing</p>
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		<p>(first and second call: 2014-03-12/2014-06-26)</p> <p>BG10-2014: Consolidating the economic sustainability and competitiveness of European fisheries and aquaculture sectors to reap the potential seafood markets (first and second call: 2014-03-12/2014-06-26)</p> <p>SFS10-2015: Scientific basis and tools for preventing and mitigating farmed mollusc diseases (first and second call: 2015-02-24/2015-06-11)</p> <p>SFS11-2015: Consolidating the environmental sustainability of European aquaculture (first and second call: 2015-02-24/2015-06-11)</p> <p>SFS14-2014: Authentication of food products. Submission deadline 12 March 2014. Another round within FS 2015 should be announced by the end of 2014.</p> <p>BG1-2015: Improving preservation and sustainable exploitation of</p>
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		Atlantic marine ecosystems (first and second call: 2015-02-24/2015-06-11)
Observing systems and access to data, modelling/forecasting	<p>Annually more than 100 research vessel surveys, equalling more than 1200 days at sea, are coordinated by ICES to ensure best use of resources, and to cover as broad a geographic area as possible. Surveys are based on;</p> <ul style="list-style-type: none"> - Identification of monitoring requirements for science and advisory needs; and - Evaluation and optimization of monitoring strategies <p>The ICES Data Centre manages a number of large dataset collections related to the marine environment covering the NE Atlantic, Arctic Sea, Baltic Sea, Greenland Sea and Norwegian Sea. (http://www.ices.dk/marine-data/Pages/default.aspx). The data originate from national institutes that are part of the ICES network of member countries that include all countries bordering the NE Atlantic and Baltic Seas.</p> <p>The data are primarily related to national monitoring programmes and associated to a number of thematic areas including Fisheries, environmental pollution and effects, biodiversity and the physical conditions of the sea and seabed.</p> <p>ICES has a well-established and open access data policy http://www.ices.dk/marine-data/guidelines-and-policy/Pages/ICES-data-policy.aspx</p> <p>Through its oceanography and ocean observing groups, ICES is developing online products and services on ocean trends, zooplankton and modelled estimates of ecosystem trends.</p>	<p>BG6-2014: Delivering the sub-sea technologies for new services at sea (first and second call: 2014-03-12/2014-06-26)</p> <p>BG8-2014: Developing in-situ Atlantic Ocean Observations for a better management and sustainable exploitation of the maritime resources (first and second call: 2014-03-12/2014-06-26) (ICES approached)</p> <p>BG9-2014 Acoustic and imaging technologies (first and second call: 2014-03-12/2014-06-26; ICES approached)</p>

<p>Marine ecology</p> <p>Microbial</p>	<p>The ICES Working Group on Phytoplankton and Microbial Ecology (WGPME; http://www.ices.dk/community/groups/Pages/WGPME.aspx) provides review and advice on the sampling methods and diversity issues of phytoplankton and other planktonic microbes.</p> <p>In addition to offering expert review and advice on sampling methods and diversity issues, the group also carries out phytoplankton and microbial plankton sampling activities in the North Atlantic and adjacent seas, performing comparative analyses of time-series in relation to climate variability, eutrophication, and ocean acidification.</p> <p>The joint ICES–IOC working group (WGHABD) on harmful algal blooms have a data system up and running and are an example of a truly ‘North Atlantic’ cooperation http://ices.dk/community/groups/Pages/WGHABD.aspx</p>	<p>BG3-2014: Novel marine derived biomolecules and industrial biomaterials (first and second call: 2014-03-12/2014-06-26)</p> <p>BG4-2014: Enhancing the industrial exploitation potential of marine derived enzymes (first and second call: 2014-03-12/2014-06-26)</p>
<p>Ocean literacy</p>	<p>ICES promotes Ocean literacy through an active and multi-faceted communication programme aimed at stakeholders and the informed public:</p> <ul style="list-style-type: none"> - Annual dialogue meetings with recipients of advice and industry; - Recently developed “popular advice” an easy to read summary of ICES advice (http://ipaper.ipapercms.dk/ICESPublications/Popularadvice/ICESPopularAdvice/); - Publication and promotion of marine science and ICES work in the <i>ICES Journal of Marine Science</i> (http://www.ices.dk/publications/ijms/Pages/default.aspx), Cooperative Research reports (http://www.ices.dk/publications/our-publications/Pages/Cooperative-Research-Reports-(CRR).aspx), Techniques in Marine Environmental Sciences (http://www.ices.dk/publications/our-publications/Pages/-ICES-Techniques-in-Marine-Environmental-Sciences-.aspx), annual magazine <i>ICES Insight</i> (http://www.ices.dk/publications/our- 	<p>BG11-2014: Monitoring, dissemination and uptake of marine and maritime research (ICES approached)</p> <p>BG13-2014: Ocean Literacy – Engaging with Society – Social Innovation (ICES approached)</p>

	<p>publications/Pages/ICES-Insight.aspx), ICES Newsletter(http://www.ices.dk/news-and-events/news-archive/newsletters/Pages/default.aspx), ICES website (www.ices.dk), as well as through social media platforms LinkedIn, Facebook, and Twitter.</p> <p>- ICES Training Programme (http://www.ices.dk/news-and-events/Training/Pages/default.aspx) offers courses from advanced levels to basic introductions aimed at non-scientists.</p>	
<p>Marine Spatial planning/ Marine protected areas/integrated coastal zone management/Seabed and benthic habitat mapping</p>	<p>ICES Working Group for Marine Planning and Coastal Zone Management (WGMPCZM) is an inter- and trans-disciplinary group, involving both social and natural sciences and administrations in ICES Member countries.</p> <p>ICES was recently used as a forum to run a Dutch and Canadian workshop on risk assessment for spatial management (using the bow-tie approach, WKRASM). This showed the value of ICES as a trans-Atlantic resource for hoisting joint initiatives. The increasing intensity and establishment of new sea uses also increases the pressure on coastal and marine ecosystems. In order to deal with the resulting conflicts and cumulative impacts, new planning tools and integrated approaches to planning and management are being developed in Europe as well as in Canada and the US. Pushed in particular by the European Union, Marine Spatial Planning (MSP) is currently evolving as one of the major tools for integration of different demands for marine space and resources.</p> <p>ICES Working Group on Marine Habitat Mapping (WGMHM; http://www.ices.dk/community/groups/Pages/WGMHM.aspx) coordinates the review of habitat classification and mapping activities in the ICES area and promotes</p>	<p>BG5-2014: Preparing for the future innovative offshore economy (deadline: 2014-06-26)(ICES approached)</p>

	<p>standardization of approaches and techniques, along with their relevance to regional conventions and European directives and more specifically among them, the MSFD. WGMHM examines techniques with a capacity to address these issues, whether for direct mapping or through modelling.</p> <p>ICES has created a habitat map metadata catalogue, including imports from the MESH and MESH Atlantic projects (Mapping European Seabed Habitats).</p> <p>ICES has worked on Marine Protected Areas (MPAs), Vulnerable Marine Ecosystems (VMEs), and Ecological and Biological Sensitive Areas (EBSAs), as well as given advice on the closure of VMEs to bottom-contacting fishing gear due to the probable fragility of habitats and biota (http://www.ices.dk/community/advisory-process/Pages/Latest-Advice.aspx).</p> <p>ICES has a spatial facility http://www.ices.dk/marine-data/maps/Pages/default.aspx for both managing, distributing and viewing spatial data layers as well as cataloguing and discovery services for metadata related to ICES datasets and ICES working group and client data products. This portal is built on the open source geo-server and geo-network architecture.</p>	
Global climate change	<p>ICES–PICES Strategic Initiative on Climate Change Impacts on Marine Ecosystems (SICCME)</p> <p>Phase 2: 2015-2017</p>	<p>BG2-2015: Forecasting and anticipating effects of climate change on fisheries and aquaculture (first</p>

	<p>Continue to advance new science focused on climate change effects on marine ecosystems through theme/topic sessions and workshops;</p> <p>Update and improve forecasts with IPCC AR5 scenarios;</p> <p>Convene an international symposium in 2016;</p> <p>Develop regional synthesis reports;</p> <p>Initiate inter-sessional training for projecting climate change impacts on marine ecosystems;</p> <p>Continue collaboration with global climate change research community.</p> <p>and the bi-annual ICES Report on Ocean Climate, which is available online: http://ocean.ices.dk/iroc/</p> <p>The joint ICES/OSPAR Study Group on Ocean Acidification (SGOA) has been formed to develop an ocean acidification monitoring programme for the waters of the OSPAR area. SGOA brings together experts from the disciplines of chemistry, biology, and others to address the challenge of designing a long-term monitoring program that examines both the biogeochemical changes associated with ocean acidification and the responses of potentially-sensitive marine life. The SGOA is currently in its second year of a three year term and is co-chaired by Evin McGovern (Ireland) and Mark Benfield (USA).</p>	and second call:2015-02-24/2015-06-11)
Arctic	ICES contributes to Arctic research through a number of working groups that focus on ecosystem components such as zooplankton ecology, and subarctic fish stocks. ICES efforts are expanding to address several other issues including hydrography	BG15-2014: European Polar Research Cooperation (deadline: 2014-06-26)

		<p>and warming of the Arctic Ocean, modelling of biological consequences of a decrease in sea ice, and evaluating the environmental risks of oil and gas exploitation and shipping, including the spreading of non-native species (http://www.ices.dk/explore-us/Action%20Areas/Pages/Arctic.aspx).</p> <p>The Arctic offers ICES the opportunity to cooperate with international science organizations in several key areas, such as integrated observing systems and ecosystem assessments, survey coordination and marine spatial planning.</p> <p>ICES in addition holds Arctic and sub-Arctic data (e.g., contaminants data for the Arctic Council, Arctic Monitoring and Assessment Group (AMAP) and the bi-annual ICES Report on Ocean Climate, which is available online: http://ocean.ices.dk/iroc/)</p> <p>The ICES/NAFO Working Group on Harp and Hooded Seals (WGHARP) compiles and analyses data regarding harp and hooded seals to provide the basis for the annual ICES advice regarding the stock status and the fisheries for the following year.</p>	
Education training	and	<p>The ICES Training Programme (http://www.ices.dk/news-and-events/Training/Pages/default.aspx) was initiated in 2009 to help build capacity in ICES, to support, ensure the necessary skills and quality assurance by the scientists involved in the advisory process, to explain the advisory process to stakeholders and the informed public, and to attract new scientists to the ICES work. Over 30 courses have been offered on a wide diversity of skills, including: stock assessment (introductory and advanced), ecosystem modelling, model building, management strategy evaluation, Bayesian inference, fisheries advice, trawl survey design and evaluation, integrated ecosystem assessment, analysing and visualization of Vessel Monitoring Systems, communication of science and advice, and how to lead an effective technical meeting. Each course was taught within the context of the ICES science and advisory system to demonstrate best practices as well as state-of-the-art</p>	<p>'Marie Curie' call 'Mobility for growth'</p> <ul style="list-style-type: none"> - Research and innovation staff exchange MSCA RISE –2014, submission deadline 24 April 2014; - Co-funding of regional, national, and international programmes MSCA COFUND 2014, submission deadline 02 Oct 2014

	<p>technical skills. Almost 1000 students have attended ICES courses from over 30 countries. Most students have been from ICES member countries, representing all member countries but one. Many students and several instructors are from other countries and cooperating organizations. In 2013 alone, the ICES Training Programme ran six courses, reaching a total of 150 participants.</p>	<ul style="list-style-type: none">- Individual fellowships MSCA-IF-2014, submission deadline 11 Sep 2014
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1.1. Background Agreements on Transatlantic Cooperation

International cooperation agreements on science and technology between the EU, Norway, Russia, and Iceland with third parties in general, and the USA and Canada in particular, are well established and date back into the previous century¹.

For **Canada**, a **Framework Agreement**² was signed in 1976 that constitutes the basis of its cooperation with the European Union, and the bilateral relationship progressed since the Joint Political Declaration on Canada–EU relations was signed in 1996³. In 2002, it was decided to evaluate the relationship and a comprehensive review was launched. As a result, new actions were recommended to enhance the relationship and strengthen the dialogue, with a number a specific priorities for enhanced cooperation of which, however, science was not an outstanding feature⁴.

Moreover, Canada and the EU have a long and successful history of Science and Technology cooperation under the previous Framework Programmes (FP5, FP6, and FP7). There are currently or have been recently approximately 300 Canadian researchers participating in FP7 projects from across 36 Universities and the private sector. This is more than in FP4, FP5, and FP6 projects combined and is an indication that the cooperation is attractive to both sides and is working. Through this participation, a total of 10.7 Million€ came into Canada through directly funded Canadian researchers (i.e., the researcher was deemed essential to the success of the FP7 project). In H2020, Canada and the EU will also pursue cooperation in the areas of marine and arctic research (BG8, BG14).

Canada supports ICES participation in H2020 projects, specifically in projects related to transatlantic cooperation, viz. **"Canada supports Transatlantic Cooperation activities including the involvement of participants, such as the International Council for the Exploration of the Sea (ICES), in the EU Horizon 2020 research project BG-14-2014 (Supporting international cooperation initiatives: Atlantic Ocean Cooperation Research Alliance)."**⁵

For the **USA**, the **Agreement for Scientific and Technological Cooperation** between the European Community and the Government of the United States of America⁶ was signed in 1998, then renewed until 2003, and again extended until 2008 and now most recently being again renewed until 2017. The Agreement was underpinned by a 1990 **Arrangement** for a Science and Technology Task Force⁷, which has since been renewed four times. However, the Task Force has focused on marine research topics outside of those for which ICES has competence.

The implementation and status of the EU–US Agreement was externally evaluated in 2013⁸. This evaluation concluded that the cooperation on science and technology between US and EU entities is strong and that the EU–US agreement on Scientific and Technological Cooperation (S&T) remains a valid instrument for

1 <http://www.state.gov/e/oes/rls/fs/2009/140665.htm>

2 Framework Agreement for the commercial and economic cooperation between the European Communities and Canada. Official Journal of the European Communities L 260/2, 24.09.1976

3 http://www.canadainternational.gc.ca/eu-ue/commerce_international/joint_political-politique_conjointe.aspx?lang=eng

4 http://www.canadainternational.gc.ca/eu-ue/commerce_international/partnership-partenariat.aspx?lang=eng

5 ICES-Delegate of Canada 06.02.2014 to ICES by mail

6 Agreement for scientific and technological cooperation between the European Community and the Government of the United States of America. Official Journal of the European Communities L 284/37, 22.10.1998.

7 Communication from the Commission to the Council and the European Parliament EUR-Lex-52011DC0366-EN.webarchive.

8 Acheson, H. and León, G. (2013) Evaluation of the US Agreement on S&T. (Mimeo) <http://ec.europa.eu/research/iscp/pdf/evaluation-eu-us-agreement-st.pdf>

enhancing bilateral relations between the two parties. To reinforce the political dimension of the EU–US agreement and the political advantage the agreement confers as a platform for more synergistic long term, strategic bilateral cooperation it is recommended (*ibid*, p.42) that the *Commission and Member States should coordinate better their own S&T strategies with respect to the US in the framework of the new international strategy Horizon 2020 and jointly present it to US authorities with a coordinated voice.*

The USA provided a statement of support on ICES participation in H2020, especially on projects related to transatlantic cooperation: **"The U.S. supports Transatlantic Cooperation activities including the involvement of participants, such as the International Council for the Exploration of the Sea (ICES), in the EU Horizon 2020 research project BG-14-2014 (Supporting international cooperation initiatives: Atlantic Ocean Cooperation Research Alliance)."**⁹

In 2013, the European Union signed the **Galway Statement (GS) on the Atlantic Ocean Cooperation**¹⁰ with Canada and the United States of America. The overall purpose of this statement was the creation of a research alliance among the three parties. Because the specific contents of the Galway Statement were prepared by a scientific workshop¹¹, the GS gives specific guidance on priority areas of future cooperation:

These are:

- Aligning the ocean observation efforts to improve ocean health and stewardship and
- to promote the sustainable management of the ocean resources,
- to improve data sharing,
- to further the coordination of observing infrastructure,
- to further as well the coordination of benthic and habitat mapping, and
- to promote ocean literacy.

This shall be achieved by:

- Making use of existing bilateral science and technology cooperations (US–EU Science and Technology Joint Consultative Group and Canada–EU Science and Technology Joint Consultative Group),
- Recommending priorities for future cooperation, and
- Coordinating the planning and programming of relevant activities, including promoting researcher mobility.

For Norway, there is a longstanding Transatlantic Cooperation with the USA and Canada that is codified in the Strategy for Norway's Scientific and Technological Cooperation with North America¹². Norway's participation in international cooperation has increased rapidly in recent years, not least through the EU's Framework Program for Research and Technology, which is regarded as a very favourable development. Although cooperation with the United States—and to some extent also with Canada—is comprehensive, it has been outpaced by the growth rate of Norway's collaborations with Europe. Moreover, there has been a steep decline in the number of Norwegian students in North America. The Norwegian authorities want to redress this situation by intensifying Norway's scientific and technological cooperation with North America (state approx. 2004).

⁹ ICES-Delegate of the USA 30.01.2014 to ICES by mail

¹⁰ http://ec.europa.eu/research/iscp/pdf/galway_statement_atlantic_ocean_cooperation.pdf

¹¹ http://ec.europa.eu/research/iscp/pdf/galway_2013_scientific_workshop_report.pdf

¹² Nord-Amerikastrategiengelsk.pdf (without date but apparently 2004)

The thematic programs in the R&D collaboration with the USA and Canada are intended to be consistent with the priorities of the general research policy. Emphasis is attached to the development and application of basic knowledge, as well as to innovation and value creation. Special emphasis is accorded to certain areas in particular (here a selection in view of marine and maritime cooperation):

- Oil and gas-related research,
- ICT, materials and nanotechnology, maritime technology,
- marine research and technology, including the production of seafood,
- climate research, and
- polar research and research related to the High North.

The EU-USA “Agreement for Scientific and Technological Cooperation”, originally signed in 1998 and renewed thereafter, ended in October 2013¹³. The current joint research and innovation priorities between the EU and the USA include Maritime and Arctic research, Health, Materials, and Transport. Targeted activities in these areas are developed under Horizon 2020. Many EU Member States, as well as Norway and Iceland as non-EU-Member States of ICES, have strong cooperation programmes with the US and Canada, supported by bilateral agreements at the governmental level or through funding agencies. In total 17 EU Member States and Associated Countries have individual S&T Agreements with the US, most of these focusing on agriculture, basic research, energy, health, and the environment (including climate change).

The fundamental approach of the EU-COM on how to enhance and focus the **EU international cooperation in research and innovation as a strategic approach** was detailed by the EU-COM in 2012¹⁴. The EU-COM stipulates (*inter alia*) that H2020 is open to participation from all countries, although not all third country participants will be automatically eligible for funding, as this will be based on underlying funding modalities and principles as elucidated in 2011¹⁵.

1.2. The Atlantic Strategy

The strategic approach of cooperation of the EU stands in close relation or is rather a part of the **Maritime Strategy for the Atlantic Ocean Area 2011** (short **Atlantic Strategy**)¹⁶ that stands beside and is associated with the **Blue Growth Strategy** (2012)¹⁷, the latter focussing on blue energy, aquaculture, maritime, coastal development, cruise tourism, marine mineral resources, and blue biotechnology. The Atlantic Strategy was created under the umbrella of the **Integrated Marine Policy** (2007)¹⁸ which encompasses the entire Atlantic Ocean from the coasts, territorial and jurisdictional waters of the five EU Member States with an Atlantic coastline, as well as international waters reaching westward to the Americas, eastward to Africa and the Indian Ocean, southward to the Southern Ocean, and northward to the Arctic Ocean.

The challenges being faced and the opportunities being given in the Atlantic Strategy are grouped in 5 overarching themes (Fig.1), i.e., (1) Implementing the ecosystem approach, (2) Reducing Europe’s carbon footprint, (3) Sustainable exploitation of the Atlantic seafloor’s natural resources, (4) Responding to threats and emergencies, and (5) Socially inclusive growth (Fig. 1).

¹³ http://ec.europa.eu/euraxess/index.cfm/links/collaboration_opportunities/north_america

¹⁴ COM(2012) 497

¹⁵ COM(2011) 810

¹⁶ COM(2011) 782

¹⁷ http://ec.europa.eu/maritimeaffairs/policy/blue_growth/index_en.htm

¹⁸ http://ec.europa.eu/maritimeaffairs/policy/index_en.htm

For ICES theme (1) and (3) are of particular relevance. In theme (1) it is emphasized that fisheries play an important role and are a central part of economies on both sides of the Atlantic, but management must be taken further: Single species management shall be replaced with multi-species long-term plans that take into account the wider ecosystem.

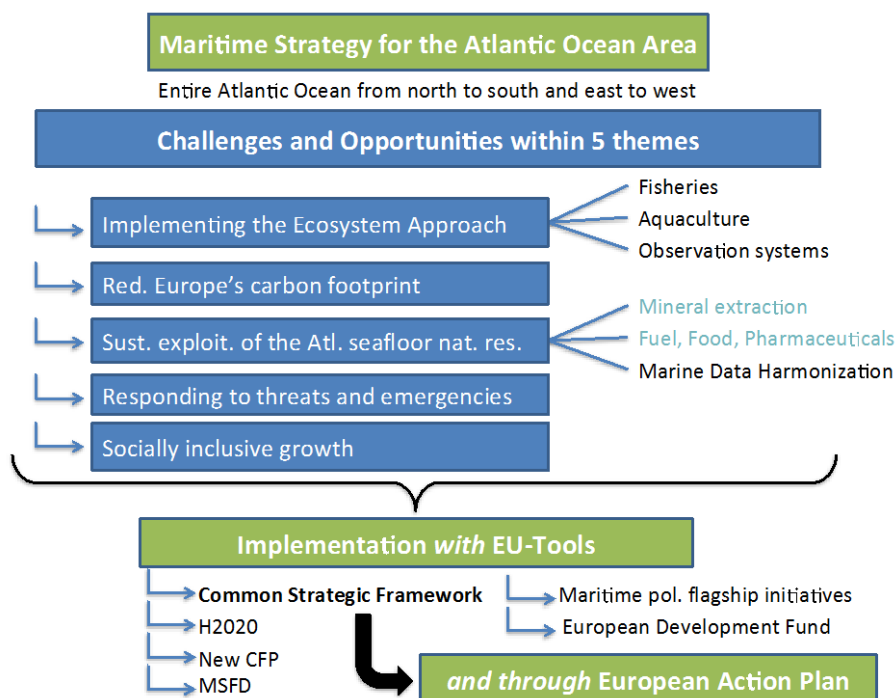


Fig. 1. Maritime Strategy of the European Commission for the Atlantic Ocean Area.

Moreover, aquaculture is another focus of this theme. However, shortage of space at the Atlantic coasts currently limits its expansion. New technologies and innovative engineering will allow industry to move further offshore, and the sharing of space with other infrastructure such as wind turbine platforms provide an opportunity. The strategy therefore promotes spatial planning as a tool for implementing the ecosystem approach in the Atlantic area.

In addition, the theme is underpinned by acknowledging that forecasting future changes in Europe's climate will not be achieved without better understanding of the Atlantic, which calls for sustainable observation systems from space and from sea of key marine variables.

Theme (3) comprises three subcategories, of which the first two, i.e. "Mineral Extraction" and "Fuel, Food and Pharmaceutical Production" are of lesser relevance for ICES. The third item, however, is of great interest. This category addresses the access to the data produced by research institutes and other public authorities. Under the title "unlocking the patrimony of marine data", the EU's marine knowledge 2020 initiative¹⁹ supports business and conservation authorities by providing access points for "Marine Data Harmonized" over sea-basins, thus reducing the costs for assembling the data necessary to design, build, and operate coastal offshore infrastructure.

¹⁹ Commission Communication "Marine knowledge 2020: marine data and observation for smart and sustainable growth" COM (2010)

To implement these themes the EU has a number of instruments at hand, such as the CFP, the MSFD, H2020 and the Common Strategic Framework (Fig. 2), and more specifically leading to the Action Plan as the most important implementation tool.

1.3 The European Action Plan

For the Atlantic area the EU-COM developed an **Action Plan for a Maritime Strategy in the Atlantic Area**²⁰ (2014–2020) (short Action Plan) in order to deliver smart, sustainable and inclusive growth, which is subsumed under the term “Blue Growth”. In the action plan priorities are specified for research and investment to reach the goals.

To further the Transatlantic Cooperation the Action Plan is fundamental, and the Commission believes that over time, the Action Plan could create a solid foundation for cooperation with other Atlantic nations. Moreover, the Action Plan is meant to be a source of inspiration to those drawing up operational programmes at a national and regional level, subject to the needs of the programme area. Furthermore, the Action Plan serves the Commission in implementing directly managed funds, including H2020, LIFE+, COSME, and directly managed elements of the EMFF.

The Action Plan stands in relation to the overarching Common Strategic Framework (CSF; Figs. 1, 2), which translates the targets and objectives of EUROPE 2020 and the Atlantic Strategy into key actions with focus on three “thematic objectives”:

(1) supporting the shift towards low carbon energy, (2) increasing the capacity for research and innovation through education and training, and bringing industry closer to research; and (3) enhancing the competitiveness of SMEs, such as those prevalent in the EU’s tourism, fishing, and aquaculture industries (Fig. 2).

The CSF is the overarching concept for focussing four executing instruments of the European Structural and Investment Funds (ESIF). These are the European Regional Development Fund (ERDF), the European Social Fund (ESF), the European Agricultural and Rural Development Fund (EARDF), and the European Maritime and Fisheries Fund (EMFF).

²⁰ COM(2013)279

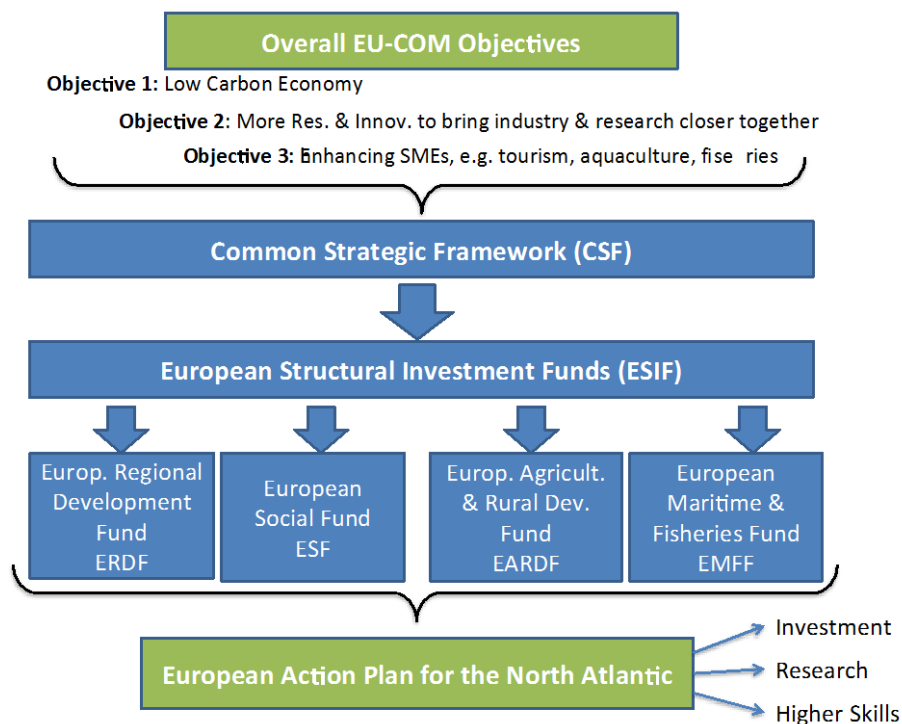


Fig. 2. Link between the objectives of the EU-COM and the European Action Plan for the North Atlantic, based on COM (2013) 279.

Based in this foundation the Action Plan aims at three target areas: (1) **Investment** for innovation in SMEs by making use of the respective instruments of the ESIF, (2) **Research** on ocean governance, the sustainable exploitation and management of marine resources, safety at sea, marine environmental protection (including the designation of coastal and high seas Marine Protected Areas). It is acknowledged that this requires data for the understanding of the ecosystem functioning and interaction as well as for modelling, forecast, and prediction. It is explicitly acknowledged that ocean observation, mapping, and forecasting as well as making this information widely available are critical. (3) Investment into **higher skills** to overcome the shortage of suitably skilled workforce for certain sectors of the industry (Fig.2).

Around the three pillars of investment to innovation, research, and higher skills a number of priorities have been defined for which the private sector, researchers, regional and national bodies, and other actors are invited to start designing projects. **In the diagram below the priorities relevant for the ICES community in general and for the transatlantic cooperation in particular are selectively highlighted** (Fig.3).

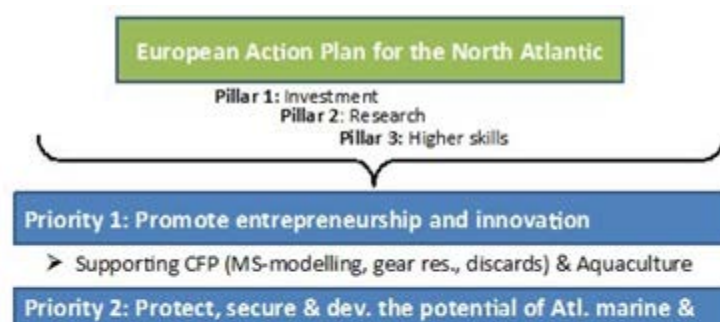


Fig. 3. The European Action plan and its 4 priorities based on COM(2013) 279.

Priority 1: Promote entrepreneurship and innovation with following specific objectives: (1.1) *sharing knowledge between higher education organisations, companies and research centres.*

- (a) networking and cooperative research between research centres, higher education and business in the Member States;
- (b) transferring knowledge and insights, as well as skills between higher education, business and research, including through regional, national and cross-border maritime clusters and technology platforms.

In addition (1.2) *improving skills in traditional Atlantic industries*: enhancement of competitiveness and innovation capacities in the maritime economy of the Atlantic area, such as shipbuilding, aquaculture and fisheries, as well as in the emerging sectors of the blue economy. (Even though aquaculture and fisheries are explicitly mentioned here this objective aims at the professional qualification and thus the competitiveness of European industrial workforces).

The third specific objective under priority 1 is to *foster adaptation and diversification of economic activities by promoting the potential of the Atlantic area* in order to support the reform of the CFP and revitalizing the EU's aquaculture industry through:

- (a) Developing improved multi-species modelling, fishing gear and related techniques and technologies so as to minimize carbon footprint, seabed damage, discards, and by-catch;
- (b) Sharing information on tools that improve fisheries managers' understanding of the socio-economic and ecosystem impacts of management measures;
- (c) Carrying out research to improve the growth, productivity, competitiveness and environmental sustainability of aquaculture (including offshore aquaculture) and the industries' ability to respond to market needs;
- (d) Improving the market position of EU-sourced fisheries and aquaculture products by improving processing, labelling, traceability and certification.

Priority 2. Protect, secure and develop the potential of the Atlantic marine and coastal environment, with its specific objectives *to improve maritime safety and security*, amongst which bullets (a) and (c) could be of particular interest in the ICES and transatlantic context:

- (a) Evaluating and extending as necessary existing warning, reporting and response mechanisms for invasive and harmful marine species and foster exchanges of the best practice on how to deal with such threats;
- (b) Developing coordinated response mechanisms to marine threats and natural disasters;
- (c) Developing, testing, and deploying new technologies to improve the inspection of vessels and enhance the safety and security of ports and shipping.

And with the specific objective to *explore and protect marine waters and coastal zones* by developing a European Atlantic observing and predicting capability [...] by:

- (a) Using existing systems and mechanisms to develop and maintain a sustainable integrated programme for surveying and observing coasts, seabed, and water column, covering the waters of the EU Member States, Outermost Regions and Overseas Countries and Territories from the coasts to the deep ocean;
- (b) Developing new instruments and platforms for ocean observation and ecosystem monitoring (including seabed mapping) that increase the number of parameters that can be measured automatically;
- (c) Contributing to a more effective stewardship, cataloguing, and distribution of interoperable marine data and a multi-resolution seabed map through contributions to a European Marine Observation and Data Network;
- (d) Developing a network of coastal oceanographic forecasting systems (including risk assessment) that build on the Copernicus marine service.

And contributing to this by addressing **global change issues** through:

- (a) Supporting an assessment of the carbon footprint of the blue economy in the Atlantic area;
- (b) Developing a platform for exchanging best practice on emissions reduction and energy efficiency;
- (c) Developing cooperative partnerships to identify and monitor the impacts of global climate change on marine activities, ecosystems and coastal communities in the Atlantic area, including developing better predictive and risk assessment capabilities.

As well as with supporting marine environmental protection and efforts to achieve “**good environmental status**” of the Atlantic waters by 2020 through:

- (a) Continuing to build on national plans, OSPAR processes and Natura 2000 sites to help develop a coherent network of MPAs for Europe’s Atlantic coast by agreeing on good practices and shared evaluation processes;
- (b) Encouraging further cooperation between Member States, including through OSPAR, for example on coordinated and integrates monitoring programmes and joint action to restore ecosystems.

[...] with the additional specific objective to *sustainably manage the marine resources* with regards to **mining of minerals** in the Atlantic Ocean and **marine biotechnology** [...]

With the specific objective to support the *exploitation of the renewable energy* potential of the Atlantic area’s marine and coastal environment, i.e. the **offshore renewable energy** [...]

Priority 3: Improve accessibility and connectivity that is focussed at port interconnectivity and port networks.

Priority 4: Create a socially inclusive and sustainable model of regional development, which addresses need of coastal development e.g. tourism.

In this environment of European – Canada US-American collaboration and European research funding and in advance of the onset of the Horizon 2020-research framework the Galway Statement on the Atlantic Ocean Cooperation was signed in May 2013²¹.

1.4. Other underlying Transatlantic Research Priorities and their conceptual framework

Canada developed a catalogue of priorities on ocean research in 2012 and condensed these into 40 questions²² that are the guiding questions in research and are therefore also focal points for establishing transatlantic cooperation.

The **USA** have defined and updated their research priorities in 2013²³ by their National Science and Technology Council and its Subcommittee on Ocean Science and Technology. The Priority Objectives of the National Ocean Policy of the USA are

1. Ecosystem-based Management,
2. Coastal and Marine Spatial Planning,
3. Inform Decisions and Improve Understanding,
4. Coordinate and Support Management,
5. Resiliency and Adaptation to Climate change and Ocean Acidification,
6. Regional Ecosystem Protection and Restoration,
7. Water Quality and Sustainable Practices on Land,
8. Changing Conditions in the Arctic, and Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure.

1.5. Relevant research programmes with Transatlantic Cooperation dimension, including both the Atlantic and the Arctic

1.5.1. Canada / Atlantic (1)

Under the umbrella of the **Atlantic Ocean Monitoring**²⁴ Canada established its **Research Agenda**²⁵ for the Canadian Atlantic in which *prioritization* of conducted research and national as well as international *cooperation* play a central role. It was developed with the aim of collecting and analysing the biological, chemical, and physical data to detect and monitor seasonal and inter-annual variability in Eastern Canadian waters.

The major element of this is a Balanced Science Programme that is based on:

²¹ Galway Statement on Atlantic Ocean Cooperation Launching a European Union – Canada – United States of America Research Alliance, 23/24 May 2013.

²² 40 Priority Research Questions for Ocean Science in Canada. A priority-setting exercise by the Core Group on Ocean Science in Canada. Council of Canadian Academies, 2012.
http://www.scienceadvice.ca/uploads/eng/assessments%20and%20publications%20and%20news%20releases/oceans_1/oceansworkshopreport_web_en.pdf

²³ Science for an Ocean Nation: Update of the Ocean Research Priorities Plan. Subcommittee on Ocean Science and Technology National Science and Technology Council (February 2013), Executive Office of the President of the United States.
<http://www.innovation.ca/sites/default/files/Rome2013/files/US%20NSTC%20Ocean%20Research%20Plan%202013-17.pdf>

²⁴ <http://www.dfo-mpo.gc.ca/science/oceanography-oceanographie/observations/atlantic-atlantique-eng.html>

²⁵ Five-Year Research Agenda (2007-2012). Fisheries and Oceans Canada. <http://www.dfo-mpo.gc.ca/science/publications/fiveyear-quinquennal/index-eng.htm>

- Building long-term stability that requires to support decision and policy making by maintaining (1) an Integrated Monitoring Programme focussing on the aquatic ecosystems, and (2) a comprehensive Scientific Data Management programme.
- Maximizing flexibility to respond to the evolving departmental and government-wide priorities by (1) carrying out an integrated research programme aligned with priorities, (2) providing timely and sound scientific advice supporting decision-making, and (3) developing products and services for the Public Good.

Under this research agenda 10 **Research Areas** have been selected for prioritization, each further specified by **Priority Areas of Research** that could be the docking stations for cooperation. The research areas are:

1. Fish Populations and Community Productivity
2. Habitat and Population Linkages
3. Climate Change and Variability
4. Ecosystem Assessment and Management Strategies
5. Aquatic Invasive Species
6. Aquatic Animal Health
7. Sustainable Aquaculture
8. Ecosystem effects of Energy Production
9. Operational Oceanography
10. Emerging and Enabling Technologies for Regulatory and Policy Responsibilities

The Atlantic Ocean Monitoring focuses on 5 research programmes:

1. The Atlantic Zone monitoring Programme (AZMP)²⁶
2. The Atlantic Zone off-shelf Monitoring Programme²⁷
3. The Bedford Basin Plankton Monitoring Programme²⁸
4. The Coastal shallow Water Temperature Climatology for Atlantic Canada²⁹
5. Tides, Currents and Water Levels³⁰

Canada / Atlantic (2)

The **Institute of Island Studies** at the University of Prince Edward Island launched the **North Atlantic Islands Programme**³¹ (NAIP) is an association of island-dwellers intent on fostering co-operation among the islands of the North Atlantic rim and our mainland neighbours. The Programme is designed to facilitate

²⁶ <http://www.isdm-gdsi.gc.ca/isdm-gdsi/azmp-pmza/index-eng.html>

²⁷ <http://www.bio.gc.ca/science/monitoring-monitorage/azomp-pmzao/azomp-pmzao-eng.php>

²⁸ <http://www.bio.gc.ca/science/monitoring-monitorage/bbmp-pobb/bbmp-pobb-eng.php>

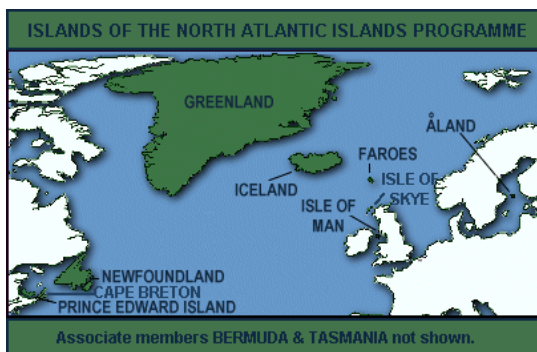
²⁹ http://www.bio.gc.ca/science/data-donnees/archive/coastal_temperature/coastal_temperature-eng.php

³⁰ <http://www.charts.gc.ca/twl-mne/index-eng.asp>

³¹ <http://www.upei.ca/~iis/naip.htm>

research, information exchange and shared initiatives among our members. The members around the Atlantic are Prince Edward Island, Newfoundland, Greenland, Iceland, Isle of Man, the Faroes, and the Isle of Skye.

Newly reconstituted early in the year 2000, the primary function of the North



Atlantic Islands Programme is now that of a facilitating network. The NAIP Steering Committee endorses comparative research projects on and about islands. It also encourages exchange among member islands through ongoing public engagement activities and an annual North Atlantic Forum.

1.5.2. Denmark

The Kingdom of Denmark specifies in its Arctic Strategy 2011–2020 that Canada, USA, Norway, and Iceland are key partners for close cooperation in areas such as the exploitation of resources, maritime safety, climate and environment, indigenous peoples, research, education, health and defense.

Joint cooperation between Greenland, Denmark, and the US is based on the Igaliku Agreement³², signed in 2004 consisting among others of an agreement on technical and economic cooperation. The Joint Committee cooperation is a tripartite forum that aims to strengthen and promote cooperation among others in research, technology and education.

As a direct consequence of the oil disaster in Louisiana, the Greenland Bureau of Minerals and Petroleum and the National Energy Board of Canada, which are responsible for determining the respective regulations for Greenland and Canadian exploitation of oil and natural gas in the Arctic, entered into a bilateral agreement in 2010. Furthermore, Denmark and Canada are party to the CANDEN-agreement³³ on environmental cooperation.

The premise of the Arctic Strategy stems from the Arctic Council Declarations and the Ilulissat Declaration of 2008³⁴, in which the coastal states of the Arctic Ocean committed themselves to cooperation in the Arctic. The Danish Integrated Maritime Strategy issued in 2010³⁵, elaborates further on cooperation within the Arctic Council, IMO and other relevant international fora, in order to introduce specific measures for preventing accidents and mitigating the effects of maritime activities.

1.5.3. Germany / Atlantic (1)

KDM - the German Marine Research Consortium is made up of sixteen institutions and universities of Germany in the field of marine and polar sciences as well as of coastal research. The members are part of a European and global network of such institutions. With approximately 2,200 scientists of basic and applied marine research, KDM provides comprehensive expertise to meet global challenges having to do with the sea and our environment.

32 <http://2001-2009.state.gov/documents/organization/96094.pdf>

33 e.g. see: http://www.itopf.com/_assets/country/greenland.pdf

34 http://en.wikipedia.org/wiki/Ilulissat_Declaration

35 http://www.dma.dk/sitecollectiondocuments/publikationer/sfs-samlet-maritim-strategi_3uk.pdf

1. advancement of science and research, in particular in the field marine sciences including polar and coastal research,
2. fostering the collaboration of its member institutions and the development of joint research programmes,
3. intensifying the cooperation within German, European and international marine research and the use of infrastructure and large equipment,
4. joint public relations addressing decision makers in Germany and the European Union.

KDM participates in a number of international projects in the field of European and global ocean research. It coordinates the scientific contributions of participating German research institutes, takes care of administrative matters and ensures that German contributions can be conducted jointly within the European network. On the following pages, you will find additional information on current projects with KDM participation.

1. Read more about our research projects:
2. ECO2 - Sub-seabed CO₂ Storage: Impact on Marine Ecosystems
3. EMSO - European Multidisciplinary Seafloor Observatory Infrastructure
4. Euro-Argo - European component of the international Argo project
6. GITEWS - German Indonesian Tsunami Early Warning System

Germany / Atlantic (2) & Arctic

The **Helmholtz Association of German Research Centres** (German: *Helmholtz-Gemeinschaft Deutscher Forschungszentren*) is the largest scientific organisation in Germany. It is a union of 18 scientific-technical and biological-medical research centres. The official mission of the Association is "solving the grand challenges of science, society and industry". Scientists at Helmholtz therefore focus research on complex systems, which affect human life and the environment. This includes the development of strategies to cope with a changing Earth and its intrinsic threats as well as of strategies steering human impact on the geo- and ecosystems. The central challenges (frequently referred to as "grand challenges") facing the "Earth and Environment" research field are focused in six fields of concern:

- Earth system dynamics and risks,
- climatic variability and climate change,
- water availability and management,
- ecosystem dynamics and biodiversity,
- sustainable use of resources and
- socio-political dimensions of global change.

These grand challenges require massive research efforts due to the fundamental characteristics of the Earth system: as a result of the interaction of numerous components (geosphere, hydrosphere, cryosphere, atmosphere, biosphere, anthroposphere etc.), the system as a whole is extremely complex. All processes operate on very diverse spatial and temporal scales with intricate patterns of interaction that preclude simple predictability. This requires a highly integrated scientific approach, suitable for capturing the complexity of the Earth system and its interaction with humanity and for developing mitigation and adaptation strategies for solving the problems at hand. The multiplicity of questions that need to be processed, the capacity of the overall research scene as well as effective use of the scientific infrastructure make "excellence" networks) beyond the Helmholtz community. The research field has already taken concrete and strategically oriented measures to actively participate in shaping the European research arena within the framework of Earth system and environmental

research. Networks and strategic cooperation are seen as particularly important measures for the processing of new and urgent social problems, as a reaction to current challenges for the further development of capacity in the "Earth and Environment" research field and for optimal use of the infrastructure.

There are four major research programmes of the Helmholtz Association:

Programme 1 Geosystem: The Changing Earth aims at understanding, quantifying, and predicting processes in the geosphere and their interaction with the hydrosphere, atmosphere and biosphere with a focus on the human scale. The mission of the programme is to provide information and to outline adaptation strategies based on monitoring and modelling of key geo-processes; assessing their impact on the human habitat; developing solutions for disaster reduction; and designing concepts for exploring the subsurface. A key component is Modular Earth Science Infrastructure, integrating satellites, airborne systems, permanent and mobile instrument networks, observatories, drilling equipment, as well as analytical and experimental facilities.

Programme 2 Polar Regions and Coasts in a changing Earth System (PACES) aims at identifying the role of processes at high latitudes on past, current and future changes of the Earth system. Research will focus on (1) the changing Arctic and Antarctic, (2) coasts affected and mediated by climatic and anthropogenic drivers, (3) lessons from the Earth's past, and (4) a synthesis via the integration of the polar perspective into Earth System models. To achieve these goals the programmes rely on existing and will develop new, sophisticated and modern infrastructure for coastal, ocean and polar research. PACES will provide insights on naturally driven Earth climate fluctuations and their anthropogenic perturbation and consequential effects and thus provides the basic scientific understanding for appropriate political decisions. The open oceans, coastal areas and Polar Regions are systems linked by a large number of processes and interdependencies. Each, however, poses its own very special challenge, emanating from its unique environment and role within the Earth System, which needs to be met individually. This programme, therefore, is divided into 4 research topics and 2 additional topics on the infrastructure required for reaching the envisaged goals. They are:

- The changing Arctic and Antarctic
- Coastal Change
- Lessons from the past
- Synthesis: the Earth system from a polar perspective
- Infrastructure
- Large Scale facilities

Programme 3 Atmosphere and Climate studies the role of the atmosphere in the climate system and its underlying processes, which are of crucial importance for climate variations, natural disasters, and air quality, and thus determine the living conditions on Earth. The chemical composition of the atmosphere is monitored with innovative satellite, aircraft, and ground-based techniques. Dynamical, chemical, hydrological and biological processes as well as related feedback mechanisms and interactions with other climate subsystems are studied in order to improve the prediction of global and regional climate change. Integrative analysis and forecast systems are developed, in which the use of observations for modelling are optimized via data assimilation. Achieving a sound scientific base on the atmosphere and climate is a prerequisite for adapting to climate change, for coping with natural disasters, and for limiting air pollution in a world of rapidly increasing population.

Programme 4 **Terrestrial Environment – Strategies for a sustainable response to climate and global change** aims at safeguarding the natural basis of human life and health, while simultaneously shaping options for societal and economic development. Research will focus on (i) sustainable land use options, (ii) novel utilisation of plants and microbes for sustainable bio-production, (iii) the management of water resources systems, (iv) the safeguarding of aquifers for drinking water provision, (v) risk assessment and risk reduction for chemicals in the environment, and (vi) on the complementing establishment of joint technological and methodological platforms for the monitoring and integrated assessment of terrestrial systems. The Programme will develop management strategies for the sustainable use of natural resources that integrate strategies for an adaptation to Global Change.

Cross-sectional issues related to the main issues but beyond the established programme structures have proven to be a flexible instrument for the purpose of comprehensive reaction to new social challenges and problems. They contribute to the development of interdisciplinary links between the established programmes. The following cross-sectional issues are being processed in the "Earth and Environment" research field:

- Mitigation of and Adaptation to Climate Change,
- Risk Habitat Megacity,
- Disaster Management, and
- Functions of biodiversity in the conservation of cultural landscapes.

1.5.4. Ireland / Atlantic

- US National Oceanic and Atmospheric Institute (NOAA) and the Marine Institute on Marine Resource Management: Coordination and co-operation in respect of resource management and management-oriented research collaboration; resource mapping and management programmes for Ireland's EEZ and technology and instrumentation. Signed 1995 not limited.
- US Department of Energy and Department of Energy (Minister for Communications, Energy and Natural Resources) on Renewable Energy Generation: Co-operation in Renewable (including marine energy). Signed 2012 not limited.
- Canada: Memorial University of Newfoundland and Marine Institute Ireland on Fisheries and Ecosystem Science: Cooperation between fisheries and oceanographic related survey activities, charter of the RV Celtic Explorer (Marine Institute) to Memorial University of Newfoundland.
- NEPTUNE (Canada), Ocean Networks Canada, University of Victoria and the Marine Institute Ireland on Ocean Observatories: Reciprocal research and educational experiences for researcher, faculty, students and employees, Uvic/SmartBay/CELNET visiting researcher status, staff secondments.

1.5.5. Norway / Atlantic

The **Research Council of Norway**³⁶ adopted an international strategy (2010-2020) to promote international cooperation in the government with papers on research an innovation. The Council adopted the rule that firstly all activities (*inter alia* the research programmes) must include clearly defined objects and plans of international cooperation. Secondly, the Research Council will promote Norwegian participation in joint programmes across natural boundaries, and

³⁶ www.forskningradet.no/eu/international

thirdly, will the Research Council develop financial instruments to support the international cooperation.

1.5.6. United Kingdom /Atlantic

Marine and maritime research programmes³⁷ in the UK are developed by the **National Environmental Research Council (NERC)**³⁸. Amongst the many programmes are in this context some of particular interest and potential of transatlantic cooperation

- Arctic Research Programme³⁹
- Biodiversity and Ecosystem Service Sustainability (BESS)
- Carbon Capture and Storage
- Changing Water Cycles
- Coastal Sediment Systems
- Drivers of Variability in Atmospheric Circulation
- Earth System Modelling Strategy (ESM)
- Environmental Virtual Observatory (EVO)
- Ice Sheet Stability
- International Ocean Discovery Programme
- Joint Weather and Climate Research Programme (JWCRP)
- Marine Ecosystems
- Marine Renewable Energy
- Next Generation Weather and Climate Prediction (NGWCP)
- Ocean Acidification Research Programme
- Ocean Shelf Edge Exchange
- Probability, Uncertainty and Risk in the Environment
- Quantifying Uncertainty
- Shelf Sea Biogeochemistry
- Storm Risk Mitigation through Improved Prediction and Impact Modelling
- Sustainable Marine Bio-resources
- UK International Ocean Discovery Programme (UKIODP)
- Understanding and Predicting the Ocean Surface Boundary Layer
- Valuing Nature
- Valuing Nature Network

1.5.7. Spain /Atlantic

Spain is involved in the NEREIDA project that has a strong transatlantic component. It is a Spanish-led multidisciplinary and international project with contribution from various NAFO contracting parties such as Canada, the UK, and Russia, and was initiated in response to the UNGA Resolution 61/105. The main objective of the NEREIDA project is to gather information for the identification and delineation of VMEs in the NAFO Regulatory Area with special focus on those dominated by deep-water corals and sponges. This demarcation is a necessary step in the decision making process for the protection of these areas. Several research cruises for the NEREIDA project were carried out on board the Spanish Research Vessel “Miguel Oliver” and the Canadian Coast

³⁷ <http://www.nerc.ac.uk/research/funded/programmes/>

³⁸ NERC is the over-arching organisation for the British Antarctic Survey, the British Geological Survey, the Centre for Ecology and Hydrology, the National Centre for Atmospheric Sciences, the National Centre for Earth Observations and the National Oceanography Centre.

³⁹ <http://www.nerc.ac.uk/research/funded/programmes/arctic/>

Guard Ship “Hudson” in 2009 and 2010. During these surveys, high resolution multibeam (68, 900 km²) and seismic data (18,600 km) were collected, and rock dredges (N=104), boxcorers (N=341), drop cameras, and ROVs (2,143 photographs and about 116 hours of video) were used to sample and survey the benthos. All organisms collected were identified down to the lowest taxonomic classification possible. Taxonomic identification of organisms from the photos was aided by voucher specimens collected during the NEREIDA surveys using a rock dredge and mega-boxcorer onboard the RV “Miguel Oliver”.

1.5.8. USA / Atlantic

The US-Office of Naval Research⁴⁰ (ONR) conducts an Antarctic and Global Prediction Programme, with three main categories of interest here

- Development of integrated ocean-ice-wave-atmosphere earth system models
- Improvement of the understanding of the physical environment
- Investigation on new technologies.

1.6. Intergovernmental cooperation partners of ICES with regard to the Arctic

The **Arctic Council**⁴¹ provides as a high-level intergovernmental forum a means for promoting cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic indigenous communities and other Arctic inhabitants on common Arctic issues, in particular issues of sustainable development and environmental protection in the Arctic. Member states are: CAN, DK, FIN, ICE, NO, RUS, SWE, USA.

Through its Scientific Cooperation Task Force the Arctic Council works towards an arrangement on improved scientific research cooperation among the eight Arctic States.

The Arctic Council has four **Focus Areas** with themes:

1. Environment and Climate
 - a. Climate Change
 - b. Environmental protection
2. Biodiversity
 - a. Arctic biodiversity assessment
 - b. Circumpolar Biodiversity Monitoring Programme
3. Oceans
 - a. Search and Rescue
 - b. Arctic Ocean Review
 - c. Emergency preparedness
 - d. Marine Environment
 - e. Shipping
4. Arctic People
 - a. Health and wellbeing
 - b. Indigenous people today
 - c. Language and culture

⁴⁰ www.onr.navy.mil

⁴¹ www.arctic-council.org

Embedded into these Focus Areas are four Task Forces to address specific areas of concern:

1. The Task Force on Arctic Marine Oil Pollution Prevention (TFOPP)
2. Task Force on Black Carbon and Methane (TBBCM)
3. Scientific Cooperation Task Force (SCTF)
4. Task Force to facilitate the Circumpolar Business Forum (TFCBF)

The **European Institute**⁴² has the objective to shape the European-American cooperation in the 21st Century. Its mode of operation is to organise roundtables and meetings to support scientific exchange. Topics range from Civil Society and Defence over Energy and US-AU Relations to Environment. The latter comprises *inter alia* Arctic, Oceans, Climate Change, Conservation and Mitigation⁴³.

Norden: the Nordic Council⁴⁴ launched the Nordic initiative on arctic research in 2014 with calls for proposals, comprising the main thematic areas of:

- Drivers of change in nature and society, including economic and climate modelling in the arctic,
- Arctic resource development in a global context
- Water, ecologies and life environments

The **Nordic Arctic Research Programme** (NARP)⁴⁵ is a programme initiated by the Nordic Council of Ministers to enhance the Nordic competence by building up scientific cooperation within selected areas through:

- Network building – emphasis is given to coordination of activities between existing scientific groups to enhance the overall scientific effort within the areas of priority.
- Training and mobility of researchers – to stimulate young scientists to choose an Arctic research career and to do research in a Nordic country other than their home country.
- Workshops - economic support can be applied for by either groups or individuals to analyse and define what research is needed and to prepare for larger research projects.
- Pilot studies – competence building in smaller or isolated research groups, initiation of new programmes.

⁴² www.europeaninstitute.org

⁴³ Read for instance: Valentia Pop „Baltic, Arctic and Atlantic Surveillance. Nordic Maritime Cooperation comes out in the cold“. <http://www.europeaninstitute.org/2008120232/Winter/Spring-2009/baltic-arctic-and-atlantic-surveillance-nordic-maritime-cooperation-comes-in-out-of-the-cold.html>

⁴⁴ <http://www.nordforsk.org/en/publikasjoner/joint-nordic-initiative-on-arctic-research-faktaark>

⁴⁵ <http://www.nordforsk.org/en/publikasjoner/joint-nordic-initiative-on-arctic-research-faktaark>

ToR 2

To summarise existing ICES work and other relevant work carried out by ICES Member Countries in the area of maritime transatlantic cooperation, by reference to the agreements and initiatives summarised under ToR 1.

2. Ongoing Arctic cooperation in ICES member states

2.1. Canada / Arctic

The **Arctic Net Canada**⁴⁶ is a network of Centres of Excellence of Canada that brings together scientists and managers from science, communities, agencies and private sectors. In the Arctic Net Canada are a total of 145 scientists organized from 30 Canadian universities 8 federal and 11 provinces.

The objective is to study the impact of climate change in the Canadian Arctic, including research in social science and CC impact on communities.

2.2. Finland / Arctic

The Finnish Academy declares in its Research Programme Strategy⁴⁷ that *“international cooperation in the context of a research programme enhances the quality and competitiveness of Finnish research and the Finnish research system as well as its international significance and appeal.”* To underpin this it is further elaborated (*ibid* p.7) that *“the Arctic Research Programme aims to selectively establish cooperation with research funding agencies in other countries that are committed to supporting leading-edge scientific research and with whom collaboration in arctic issues could be beneficial for Finish research.”*

For the **Arctic Research Programme**⁴⁸ of the **Academy of Finland** emphasized four thematic research areas.⁴⁹

- a. **Good quality of life in the north**
 - a. Humans as objects adapting to change
 - b. Survival of society and people in the arctic
 - c. Study of the basic situation of indigenous people
 - d. Transcultural coexistence of ethnic groups
 - e. Research on human-nature relationships
- b. **Economic activity and infrastructure in arctic conditions**
 - a. Framework for sustainable economic activities
 - b. Research related to arctic natural resources
 - c. Low emission production systems in the arctic
 - d. Research on traditional livelihood
 - e. Sustainable use of natural resources

⁴⁶ <http://www.arcticnet.ulaval.ca>

⁴⁷ [tutkimusohjelmastrategia09_210x280_ENG\(1\).pdf](http://tutkimusohjelmastrategia09_210x280_ENG(1).pdf)

⁴⁸ www.aka.fi/en-GB/A/Programmes-and-cooperation

⁴⁹ Academy of Finland, Arctic Research Programme 2014-2018, Programme memorandum. http://www.aka.fi/Tiedostot/Tiedostot/Arctic/FINAL_Arktinen%20ohjelmamuistio%20englanniksi.pdf

c. The northern climate and environment

- a. Long Span dynamics of arctic ecosystems
- b. Arctic ecosystems and climate
- c. Catchment area research: land use, nutrient dynamics and carbon cycle
- d. Biodiversity and ecosystem services
- e. Research on environmental safety and risk related to climate change

d. Cross border arctic policy

- a. Long term review of cross-boarder arctic policy
- b. Interaction between local, regional and global policies
- c. Research on operating principles of arctic institutions
- d. Research on best practice required by sustainable development
- e. Research on democracy and equality in arctic regions.

2.3. Sweden / Arctic

The **Swedish Polar Research Secretariat**⁵⁰ and the Swedish Research Council share the responsibility for planning Swedish polar research. These government agencies have established a shared roadmap for support to research in Polar Regions outside Sweden. This roadmap will serve as a start of a long-term plan for Swedish polar research⁵¹ within the programmes SWEDARCTIC and SWEDARP (2011-2015). Prioritized topics and projects within these programmes are (selected):

- Dynamics of trace metal biogeochemistry in the Arctic Ocean: A GEOTRACE cruise
- Ridge and slope study of the Easter Arctic Ocean (RISSEARC): marine chemistry project
- Ridge and slope study of the Easter Arctic Ocean (RISSEARC): marine geology and geophysics
- Arctic summer cloud experiment (ASCE): A post-RISSEARC project?
- International Siberian Shelf Study (ISSS): Permafrost degradation and greenhouse gas releases in the outer Siberian Sea
- The Lomonosov Ridge off Greenland: A Rosetta Stone for unifying Amerasian and Eurasian stratigraphies?
- The role of zooplankton in Arctic food webs
- Persistent Organic Pollutants and current-use pesticides in a changing Arctic (POPCA)
- Marine diazotrophic diversity in the polar oceans and its contribution to global nitrogen cycling
- The life cycle of clouds in the High Arctic summer, with linkages to microbiological life in the ocean and ice
- Ocean-induced glacier melting in Greenland
- Neoproterozoic orogeny in southern and central Svalbard (NOA-Svalbard)
- Taymyr revisited: A quest for former Eurasian ICE Sheet margins and mega-fauna extinction during the last glacial cycles
- Tectonic evolution of the Amerasia Basin and CALE

⁵⁰ www.polar.se/en/research/roadmap-

⁵¹ SWEDARCTIC and SWEDARP 2011-2015: Prioritized projects of the Swedish Arctic and Antarctic research programmes.

<http://www.vr.se/download/18.29e3249012d590bc34b80003171/Projekt+Polar+110118.pdf>

2.4. USA / Arctic

2.4.1. US Arctic Research Commission

Thematic programmes as well as goals and objectives of the arctic research of the USA are developed by the **US Arctic Research Commission**⁵² and proposed to the Nation's Arctic Research Programme Plan⁵³ as required by the US Arctic and Research Policy Act. In 2013 the Commission identified 5 overarching goals with a number of specific objectives.

(a) Observe, understand and respond to environmental change in the arctic

- a. Identify effort to observe climate change on ecosystems, infrastructure, economics and cultures.
- b. Synthesize research results and translate them into actionable information. Efforts by the Study of Environmental Arctic Change (SEARCH) program and through IARPC's five-year plan are steps in the right direction.
- c. Move from knowledge to action, as successfully demonstrated by the Canadian ActicNet program.

(b) Improve arctic human health

- a. Enhance biomedical and psychiatric research in mental and behavioural health, and, on a decadal basis, review and evaluate intervention efforts to update priorities and guide the scaling of successful local efforts into broader clinical interventions and public health strategies.
- b. Expand on telemedicine to diagnose and treat diseases in remote Arctic regions.
- c. Make mandatory collections of water service "status" data at all federally funded medical facilities.
- d. Address food security issues.

(c) Understand Natural Resources

- a. Support greater mapping of Arctic lands and charting of waters. The US must quantitatively assess mineral, energy, and living resources and learn more about the environmental, societal, and economic impacts of developing them.
- b. Prepare thoroughly for responding to oil spills. Challenging response conditions and unique characteristics of Arctic environments require specialized research.
- c. Develop international standards for Arctic exploration and oil and gas development, and share innovative technology and best management practices for Arctic regions.

(d) Advance Civil Infrastructure Research

- a. Maximize the design life of infrastructure – particularly of water and sanitation systems – as funding declines for construction and for operation and management.
- b. Develop Arctic-specific technologies, design, and engineering for rapid changing environments.

⁵² Report on the Goals and Objectives for Arctic Research 2013-2014 for the US Arctic Research Program Plan http://www.arctic.gov/publications/goals/usarc_goals_2013-14.pdf

⁵³ US Arctic Research Plan FY2013-2017, Executive office of the President National Science and Technology Council: http://www.whitehouse.gov/sites/default/files/microsites/ostp/2013_arctic_research_plan.pdf
www.arctic.gov/publications/goals/usarc_goals_2013-14.pdf

- c. Increase applied research to improve land, air, and sea infrastructure that supports community essentials (energy, utility, communication, and transportation). Immediate needs include collecting baseline data and mapping of coastal and nearshore environments, collection terrestrial imagery and elevation data, and installing knowledge management systems to support engineering design and assessment (e.g., an engineering atlas).

(e) Assess Indigenous Languages, Identities, and Cultures

- a. Develop an integrated Arctic indigenous languages research plan that: (1) conducts regular assessments to understand the extent and diversity of languages and their viability for future generations, (2) documents procedures to ensure that languages and place names used by Arctic people are recorded and preserved, (3) promotes interregional and international activities geared at enhancing languages use and exchanges, and (4) defines policy options and processes for language monitoring and preservation.

Following by large these recommendations by the US Arctic Research Commission the Arctic Research Program plan for 2013-2017 focuses on the following 7 goals:

Goal 1: Sea ice and marine ecosystems

- a. Develop a framework of observations and modelling to support forecasting of sea-ice extent o seasonal to annual scales for operational and research needs;
- b. Identify and study sites in the Beaufort and Chukchi Seas and the contiguous Arctic Ocean where climate feedbacks are active;
- c. Complete deployment of a Distributed Biological Observatory (DBO) in the Arctic Ocean to create long-term data sets on biological, physical, and chemical variability and ecosystem response, and
- d. Develop integrated ecosystem-process research in the Beaufort and Chuchi Seas region.

Goal 2: Terrestrial ice and ecosystems (non marine/maritime)

Goal 3: Atmospheric studies of surface heat, energy, and mass balances

- e. Improve understanding of short-lived forcers (SCFs) and their role in Arctic amplification through satellite observations, long-term *in-situ* observations and improved modelling.
- f. Improve understanding of processes controlling formation, longevity, and physical properties of Arctic clouds, including the effects of –and sensitivities to – aerosols, and
- g. Develop an integrated understanding of Arctic atmospheric processes, their impact on the surface-energy budget, and their linkages with oceanic, terrestrial, and cryospheric systems through improved satellite capabilities, ground-based observations, and representations of Arctic systems in climate and weather-prediction models.

Goal 4: Observing systems

- h. Facilitate observing-system design for the Arctic
- i. Assess local-resident priorities with respect to climate

- j. Combine *in-situ* remotely sensed observation of sea ice with local community and traditional knowledge
- k. Conduct long-term monitoring of key outlet glaciers and tidewater glaciers
- l. Monitor the biological and physical state of the Arctic marine environment
- m. Assess the effects of clouds and atmospheric constituents on surface radiation balance
- n. Assess the impact of terrestrial warming and permafrost thawing on the carbon cycle
- o. Improve data access, and
- p. Engage indigenous observers and communities in monitoring environmental parameters.

Goal 5: Regional climate models

- q. Inventory existing Federal Arctic modelling activities
- r. Encourage coordination to better represent Arctic processes in Earth-system models
- s. Build Arctic-region models to couple with regional and global approaches
- t. Develop models of Arctic land ice mass loss, connections to ocean and atmospheric variability, and implications for sea level
- u. Increase Arctic-model resolution to improve prediction and inform future research and observations
- v. Use model-derived insights to inform process research and *vice versa*, and
- w. Improve understanding of the principle drivers and uncertainties of Arctic climate changes through model validation and verification.

Goal 6: Adaptation tools for sustaining communities (non marine/maritime)

Goal 7: Human health (non marine/maritime)

2.4.2. USA / Arctic: National Oceanic and Atmospheric Administration (NOAA)

The National Oceanic and Atmospheric Administration (NOAA) has an Arctic Program⁵⁴ with four major themes:

1. Sustained Arctic Observing Network (SAON)
2. Circumpolar Biodiversity Monitoring Program (CBMP)
3. International Arctic Systems for Observing the Atmosphere (IASOA)
4. Monitoring Sea Ice

With its **NOAA Arctic Action Plan**⁵⁵ a five-year science initiative has been launched to better understand the impact of Arctic weather and changing climate on the mid-latitude zones of the United States, where weather extremes have become common in recent years.

This science initiative is part of NOAA's contribution to the National Strategy for the Arctic Region released last May and the implementation plan released in January.

NOAA, the federal agency responsible for weather forecasts and stewardship of marine resources, released its Arctic Action Plan, a document that outlines current

⁵⁴ www.arctic.noaa.gov/arp

⁵⁵ NOAA's Arctic Action Plan. Supporting the National Strategy for the Arctic Region. (2014) US Dpt. of Commerce

and future programs aimed at improving oversight of the land in northern Alaska and the marine waters off the state's northern and western coasts.

NOAA's Arctic programs encompass a broad geographic scope. In addition to land in Alaska and waters above the Arctic Circle -- the Beaufort and Chukchi Seas -- the plan covers subarctic regions in interior and western Alaska and out to the western Bering Sea.

The action plan focuses on these goals:

- Better sea-ice and weather forecasts and warnings;
- More scientific research to understand Arctic climate change and effects;
- Improved management and stewardship of Alaska's marine and coastal resources;
- Improved support of Arctic communities; and
- Increased work with international organizations like the Arctic Council.

ToR 3

To describe how the ICES cooperation structure could be used to facilitate and promote work under transatlantic cooperation agreements using the outputs from ToRs 1 and 2, including ICES position in relation to Horizon 2020 calls (e.g., BG-14-2014 “Supporting cooperation initiatives: Atlantic Ocean Cooperation Research Alliance”).

3.1. ICES Transatlantic Atlantic Cooperation

With its 20 member countries, the ICES convention area includes the Atlantic Ocean and its adjacent seas and is primarily concerned with the North Atlantic. As fish stocks and marine ecosystems are not limited by political boundaries, it is evident that the sustainable exploitation, management, as well as basic



research on the marine ecosystems is a common challenge for the nations bordering the North Atlantic areas and adjacent seas.

ICES was established more than 100 years ago as an intergovernmental, transatlantic, and pan-European organization.

ICES is a network of more than 4000 scientists from almost 300 institutes, with 1600 scientists participating in more and 100 Working Groups annually. Based on this transatlantic cooperation is common practice and a fundamental and integral part of ICES work. This transatlantic cooperation is ongoing and an essential

part of ICES identity. American and Canadian scientists play an important role in the working groups as well as in the different bodies of the ICES hierarchy. North American and European scientists participate in working groups that a wide range

of issues and are not bound by geographical limitations in the ICES research framework.

The importance of the USA/Canadian contribution to ICES is underpinned by Fig 5.

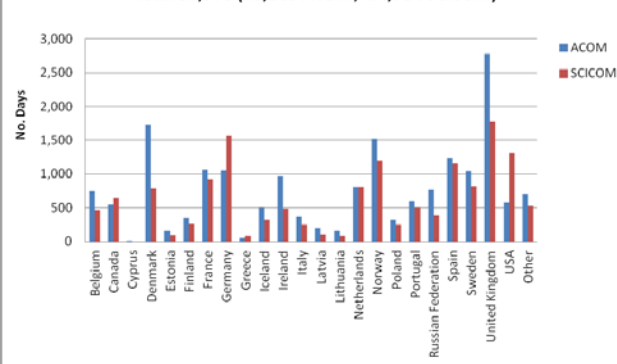
It can be clearly seen that in spite of the travel distance and costs to be covered there is a significant US-American and Canadian input to the overall goal of advancing the scientific understanding of the North Atlantic ecosystems and providing information and advice on the state of its living resources.

With regards to the 4 Priority areas of the European

Action Plan for the North Atlantic ICES contributes directly to **Priority 1** (Supporting CFP) in many ways (summary here, for details see Annex 1): Design and evaluation of management plans, modelling of different management scenarios, conducting working groups on gear research, on estimating discard, developing options for discard avoidance and on the environmental impact of aquaculture to name a few.

With regard to **Priority 2** (Protect, secure, and develop the potential of Atlantic marine and coastal environments) ICES holds a large data-base on Atlantic Data

Number of Expert Days Per Country 2010-2012
Total 32,973 (18,189 ACOM; 14,784 SCICOM)



and has a number of working and study groups on Global Climate Change. ICES runs working groups on Integrated Assessments and Ecosystem Based Management and has projects on Fisheries Management in Marine Protected Areas, all to support the MSFD and the CFP as well. Moreover, ICES has working groups on ecosystem understanding, biodiversity of the seas, Marine Spatial Planning and Integrated Coastal Zone Management.

One of the main aims of the **Galway Statement on Atlantic Ocean Cooperation** is to align research funding to ensure it is being used in the most efficient manner to avoid duplication and achieve common goals. ICES is an established Intergovernmental Organization, based on a legal mandate, *the 1964 Convention for the International Council for the Exploration of the Sea (1964 Convention)*, which through its membership⁵⁶ has a trans-Atlantic focus. One of the main aims of the convention is to collate, coordinate, and jointly work on identified trans-Atlantic research priorities as well as promote and disseminate outcomes of such joint research activities. To help connect and make use of the ICES network DG Research & Innovation would like to have ICES national contact information for the main players to help activate action to align research funding through the relevant government agencies (i.e. NOAA and DFO).

The **Transatlantic Ocean Research Alliance** referred to in the Galway Statement is, amongst others, comprised of bilateral working groups (the US – EU Science and technology joint consultative group, and the Canada – EU Science and technology joint coordinating committee) and thematic working groups (on marine and the Arctic), but membership is open to all those who can agree with the Galway Statement. ICES should now link in with US and Canada to ensure ICES inclusion in the bilateral groups.

The Galway Statement and ensuing bilateral talks between US and EU have identified five thematic areas:

- ocean stressors
- aquaculture
- observing systems
- marine microbial ecology
- ocean literacy.

3.2. ICES services related to the Thematic Areas of the Galway Statement

3.2.1. Ocean Stressors /Good Environmental Status

Descriptors of “Good Environmental Status” are not the same on both sides of the Atlantic. However, ICES work is bringing expertise from both sides of the Atlantic to develop the descriptors under the specific European environmental policy context (MSFD, and the interrelation with the Birds and Habitats Directive, as well as the Integrated Maritime Policy and Common Fisheries Policy). This is also being carried out in support of application of the ecosystem approach in general, as defined in the Convention on Biological Diversity, and at the 2002 World Summit on Sustainable Development.

ICES has adopted its Strategic Plan, 2014–2018 in recognition of the changing marine science and policy landscapes, which has evolved from focusing on

⁵⁶ Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Russian Federation, Spain, Sweden, United Kingdom, and the United States of America.

separate sectors towards the inclusion of more integrated aspects that embrace entire ecosystems.

The Strategic Plan is built around one key challenge i.e. integrated ecosystem understanding. ICES will produce integrated ecosystem assessments in regional seas as a fundamental link between ecosystem science and the advice required in applying the ecosystem approach to the management of human activities.

To ensure that ICES work is relevant and responsive to the needs of society, ICES is committed to providing the required data and information products, and scientific knowledge, in collaboration with its strategic partners on both sides of the Atlantic, as well as the requested advice.

3.2.2. Fisheries and aquaculture

This is a core area of ICES competence, with ICES providing advice on >240 marine stocks with advice elements including catch advice, stock status, stock forecasting, discarding, multi-species and mixed fisheries considerations, ecosystem overviews/integrated advice.

ICES has a long history of working and advising on aquaculture issues. ICES is a focal point for aquaculture-environment interactions, and is responsible for addressing advisory and science requests related to the sustainability of aquaculture farming practices. This was highlighted by the representative of DG Research & Innovation, as an area where ICES expertise and structures could be useful in aligning trans-Atlantic aquaculture research priorities.

3.2.3. Observing Systems–Research Vessel surveys

ICES coordinates annually more than 100 research vessel surveys, equalling more than 1200 days at sea to ensure best use of resources, and to cover as broad a geographic area as possible. The living resource surveys coordinated by ICES are a platform that could be adapted to include collection of other types of data. Currently ICES surveys are a patchwork of regionally coordinated surveys. Coordination across the Atlantic is presently lacking. Some bi-lateral trans-Atlantic transects exist but could benefit from improved coordination.

3.2.4. Access to data

ICES has a well-established Data Centre, which manages a number of large dataset collections related to the marine environment. ICES data policy⁵⁷ is based on open access and is developing regional databases and integration of data at ecoregion level. ICES Data Centre could play an important role in developing standard formats and act as a data repository for projects under, *e.g.*, Horizon 2020 (see current repository <http://www.ices.dk/explore-us/projects/EU-RFP/Pages/default.aspx>).

3.2.5. Marine Microbial Ecology

ICES advises on diversity issues of phytoplankton and other planktonic microbes including sampling and methods. This was noted as being a very specific theme in comparison to the others named in the Galway Statement. DG Research & Innovation would like to have the ICES contact information.

3.2.6. Marine spatial planning/ seabed and benthic habitat mapping

⁵⁷ <http://www.ices.dk/marine-data/guidelines-and-policy/Pages/ICES-data-policy.aspx>

ICES is developing concepts and tools for Marine Planning and Coastal Zone Management in response to the increasing intensity and establishment of new sea uses and as input to policy instruments in EU and North America.

ICES coordinates the review of habitat classification and mapping activities in the ICES area and promotes standardization of approaches and techniques, along with their relevance to regional conventions and European directives. ICES could contribute to the mapping of the European seabed habitats, by providing input on which classification system and meta-language should be applied.

3.2.7. Global Climate Change

The ICES Report on Ocean Climate (IROC) is one example of the climate work being done in ICES. ICES is also engaged with The North Pacific Marine Science Organization (PICES) to develop marine climate research via shared workshops, theme sessions, and symposia⁵⁸.

The representative of DG Research & Innovation mentioned that global climate change has become a top-priority for the US and a high-level conference “Our Oceans” is being organized in the US in June.

3.2.8. Arctic

The Arctic is a priority area for ICES, as described in the ICES Strategic Plan, 2014–2018. ICES contributes to Arctic and sub-Arctic research on: zooplankton; subarctic fish stocks; hydrography and warming of the Arctic Ocean; modelling of biological consequences of a decrease in sea ice evaluating and has identified the environmental risks of oil and gas exploitation and shipping; spread of non-native species, and ocean observing systems as potential areas of work. The representative of DG Research & Innovation mentioned that the Arctic and Atlantic are closely linked and this is especially important for Canada.

3.2.9. Training

ICES has an established training programme that could be used to promote skill development on trans-Atlantic research priorities. Work is on-going, with a pilot case for Danish Universities, to secure accreditation.

The representative of DG Research & Innovation mentioned that accreditation of training programmes should be prioritized.

3.2.10. Ocean Literacy

ICES promotes ocean literacy through a communication programme aimed at stakeholders and the informed public through a variety of outreach activities. The representative of DG Research & Innovation mentioned that they are looking to identify new ways to promote ocean literacy and target constituencies outside of the usual stakeholder groups including high-level government representatives and finance ministers.

3.3. ICES position in relation to Horizon 2020 calls

The ICES position and specific input to the Horizon 2020 call (e.g., BG-14-2014 “Supporting cooperation initiatives: Atlantic Ocean Cooperation Research Alliance”) is specified in Annex 2.

3.4. Action items

⁵⁸ (<http://www.ices.dk/community/groups/Pages/SICCME.aspx>)

1. ICES will formally declare its intention to be considered part of the Galway Statement Research Alliance via email correspondence from Anne Christine Brusendorff to Sieglinde Gruber.
2. A possible ICES–EU dialogue meeting on trans-Atlantic maritime coordination will be further explored. It was suggested that the meeting could be linked to a November meeting in Ottawa, Canada, but need to ensure that the US would also be able to participate. Possible agenda items could include: Research vessel coordination and trans-Atlantic transects; Ecosystem based approach, especially integrated ecosystem assessments; aquaculture; especially aquaculture–environment interactions, the Arctic, especially living resources, access to data, meeting with funding agents – how to maximize existing infrastructure with existing funding.
3. Aquaculture – Sieglinde Gruber will send an invitation for ICES to nominate a representative) to participate in a workshop on 28–29 May in Brussels, meeting now moved to June.
4. Further discuss the possibility of ICES to act as a project data repository for Horizon2020 projects.
5. ICES to provide a list of contacts/main entry points in Canada and the US on each of the thematic areas to Sieglinde Gruber to establish communication and facilitate knowledge sharing between DG Research & Innovation and ICES.
6. Training – Sieglinde Gruber will invite the European University Association to join the *Transatlantic Ocean Research Alliance* and inform ICES on progress.

ToR 4

To identify new opportunities for trans-Atlantic marine science and research, that ICES could engage in to support the implementation of the ICES Strategic Plan, through the ICES network (expert groups, projects, databases, etc.), or by fostering strategic partnerships.

The major opportunities for ICES for new transatlantic cooperation lie in the participation of H2020 call with direct relevance to cooperation, this is first of all BG14. However, in the light of the already existing and living transatlantic cooperation of ICES there are a few facets that are worth being further explored. There are:

4.1. Potential cooperation partners with regard to data

A number of different databases exist around the North Atlantic, all holding a variety of different oceanographic data (physical, chemical and biological data). Examples are:

Canada

1. The **Atlantic Research Data Centre**⁵⁹ of the Dalhousie University is a part of 15 Canadian data centres in a network. It is an inter-university facility with a number of other universities linked to it. It is chiefly a depository of more or less confidential Canadian data, including social data.
2. The **St Lawrence Global Observatory (SLGO)**⁶⁰ promotes and facilitates access, dissemination and exchange of electronic data and information about the St. Lawrence system by fostering a networking of data producers, in order to meet their needs and those of their clients, to improve knowledge and to assist decision making.

SLGO.ca is positioning itself as being the most complete and diversified SOURCE of scientific data regarding the St. Lawrence's ecosystem. It has done so by clustering and sharing information, data and expertise from government, academic and community agencies.

It offers data and their visualization on:

- Information on the environment: Surface currents, ice coverage, water levels & forecast, wind, air and water temperature, water salinity
- Information on living resources: Marine species identification guide for the St Lawrence, sentinel fisheries, American lobster
- Navigation Assistance information
- Scientific information: Geo-referenced Images, carbon cycle, toxins phytoplankton, ecosystem modelling, freshwater runoffs, thermograph network, ODMS archives.

The SLGO also offers services in data visualization, data management and modelling for public safety, climate change, resource management and biodiversity conservation and it includes an Oceanographic Data Management System data archive with a number of data repositories⁶¹:

- a. American lobster
- b. Biodiversity

⁵⁹ www.atlanticresearchdatacentre.dal.ca

⁶⁰ SLGO.ca

⁶¹ databib.org/repository/491

- c. Buoys
- d. Carbon Cycle (Biogeochemistry)
- e. Climatology
- f. Ecosystem health
- g. Fisheries
- h. Gulf of St Lawrence and St Lawrence estuary
- i. Navigation
- j. Ocean
- k. Public safety
- l. Remote sensing
- m. Resource allocation
- n. Thermography
- o. Tides
- p. Toxic algae

There are certainly more observing systems and databases around the North Atlantic that could and should cooperate closer to build a **North-Atlantic maritime data network**.

United States

The World Ocean Database (WOD⁶²) managed at NOAA is a comprehensive and quality controlled dataset of the physical conditions of the world's oceans. Because of the proximity of NOAA to the Atlantic, and also to the contributors to the dataset, the dataset covers extensively the North Atlantic region.

Europe

A number of well-established data networks based on European initiatives are also described below:

The Continuous Plankton Recorder (CPR) programme⁶³ based at the Sir Alistair Hardy Foundation (SAHFOS, UK). Coordinates 'on ship' collection of planktonic data and has a long established time series. Related to this, is the ICES working group on Zooplankton Ecology (WGZE) which have established an online portal for the overview of monitoring in the North Atlantic⁶⁴.

EuroGOOS⁶⁵ and MyOcean⁶⁶ are both operational oceanography observing networks offering a number of services based on remote sensing and unmanned platforms, they offer a number of forecast and modelling services and products.

Other

The Ocean Biodiversity Information System (OBIS⁶⁷) is a network of regional nodes (CanOBIS in Canada, EurOBIS in Europe etc.). The focus of this network is on biogeography and the biodiversity in the world's seas. Strengthened by the European Marine Observation Network in Europe (EMODnet) the collection of information available through the EurOBIS node has been significantly increased (including ICES dataset information).

⁶² http://www.nodc.noaa.gov/OC5/WOD/pr_wod.html

⁶³ <http://www.sahfos.ac.uk/>

⁶⁴ <http://www.wgze.net/>

⁶⁵ <http://eurogoos.eu/>

⁶⁶ <http://www.myocean.eu/>

⁶⁷ <http://www.iobis.org/>

4.2. Fishermen's involvement in fisheries advice: what can we learn from the other side?

In the Americas fishermen are more involved in the process of advice formulation and TAC-setting than in Europe. Appropriate exchange formats should be explored to learn from each other. This includes the overall involvement of fishermen in the fisheries management up to possible co-management.


4.3. Ecosystem based approach to marine management

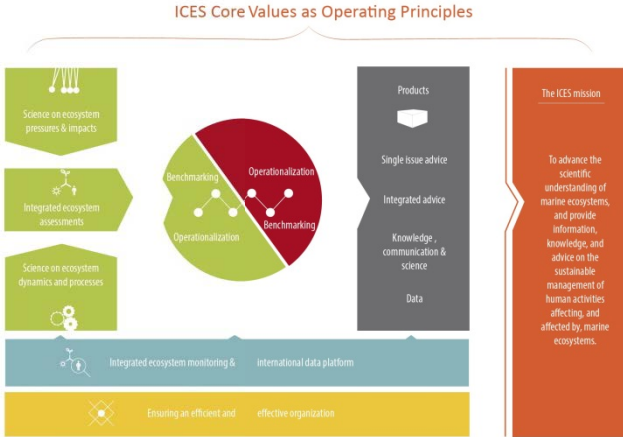
In Europe, the ecosystem approach is being made operational through the Marine Strategy Framework Directive. Similar initiatives on the North American side of the Atlantic are on-going through different mechanisms. A common platform for exchange of experience and information could possibly benefit the implementation on both sides.

4.4. Offshore Aquaculture

Research on aquaculture in offshore wind farms is carried out in different places in Europe as well as in Canada and the USA. The challenges are similar. The ICES aquaculture working group could address the environmental impacts of these offshore aquaculture sites to benefit both European and North American projects.

Annex 1: Overview of ICES work and its member states with regard to the ToRs

ToR 1		ToR 2	ToR 3	ToR 4
To summarise the main elements of the EU Maritime Strategy for the Atlantic Ocean Area and the subsequent Action Plan for the Maritime Strategy in the Atlantic Area, transatlantic cooperation agreements and initiatives (an example of the latter; the Galway Statement on Atlantic Ocean Cooperation), bilateral cooperation agreements, and any other relevant Atlantic research and cooperation agreements.		To summarise existing ICES work and other relevant work carried out by ICES Member Countries in the area of maritime transatlantic cooperation, by reference to the agreements and initiatives summarised under ToR 1.	To describe how the ICES cooperation structure could be used to facilitate and promote work under transatlantic cooperation agreements using the outputs from ToRs 1 and 2, including ICES position in relation to Horizon 2020 calls (e.g., BG-14-2014 “Supporting cooperation initiatives: Atlantic Ocean Cooperation Research Alliance”).	To identify new opportunities for trans-Atlantic marine science and research, that ICES could engage in to support the implementation of the ICES Strategic Plan, through the ICES network (expert groups, projects, databases, etc.), or by fostering strategic partnerships.
Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
EU Atlantic strategy (Developing a Maritime Strategy for the Atlantic Ocean Area, 2011)	Implementing the ecosystem approach, including (highlights): - from single species management to multi-species long-term plans , taking into account ecosystem considerations - aquaculture - marine spatial planning	<p>The aim of the ICES Ecosystem Processes and Dynamics (EPD) element is to: Develop an integrated, multi- and interdisciplinary understanding of the structure and dynamics and the resilience and response of marine ecosystems to change. This will deliver ecosystem indicators of state and function useful for the developing IEAs and for providing management advice and includes:</p> <p>Describe and quantify the state of North Atlantic Ocean regional systems:</p> <ul style="list-style-type: none">- Assess the physical, chemical and biological state of regional seas, and investigate the predominant climatic, hydrological and biological features and processes that characterize regional ecosystems.- Quantify the nature and degree of connectivity and separation between regional ecosystems. <p>Understand and forecast the impacts of climate variability and change on marine ecosystems:</p> <ul style="list-style-type: none">- Quantify the differential effects of climate change on regional eco-systems, develop species and habitat vulnerability assessments and promote management adaptation measures, for key species and re-source-dependent communities.- Understand the influence of climate impacts across a range of spatial and temporal scales, from local to global, from seasonal to multi-decadal and identify indicators of climate driven biotic responses and forecast trajectories of change. <p>Resolve and quantify ecological processes in marine ecosystems, including modelling the dynamics of food webs and their response to environmental change:</p> <ul style="list-style-type: none">- Quantify the role of structural and functional diversity in marine ecosystems in providing stability and resilience.- Investigate linear and non-linear ecological responses to change, their impacts on ecosystem structure and function, and their role in causing recruitment and stock variability, depletion and recovery.- Develop end-to-end modelling capability to fully integrate natural and anthropogenic forcing and ecosystem function. <p>Quantify the relationship between habitat condition, ecological processes and the provision of ecosystem goods and services:</p> <ul style="list-style-type: none">- Define and quantify North Atlantic ecosystem goods and services, model their dependence on ecosystem processes and habitat condition, and estimate their social, economic and cultural value.- Identify indicators of state for use in the assessment and management of ecosystem goods and services.	<p>ICES Ecosystem Processes and Dynamics (SSGEPD) Benthos Ecology Working Group (http://www.ices.dk/community/groups/Pages/BEWG.aspx); Working Group on Biodiversity Science (http://www.ices.dk/community/groups/Pages/WGBIODIV.aspx); Working Group on Cephalopod Fisheries and Life History (http://www.ices.dk/community/groups/Pages/WGCEPH.aspx); Working Group on the Biology and Life History of Crabs (http://www.ices.dk/community/groups/Pages/WGCRAB.aspx); Working Group on Crangon Fisheries and Life History (http://www.ices.dk/community/groups/Pages/WGCRAN.aspx); Working Group on Effectiveness of Recovery Actions for Atlantic Salmon (http://www.ices.dk/community/groups/Pages/WGERAAS.aspx); Working Group on Integrated Morphological and Molecular Taxonomy (http://www.ices.dk/community/groups/Pages/WGIMT.aspx); Working Group on Marine Benthic and Renewable Energy Developments (http://www.ices.dk/community/groups/Pages/WGMBRED.aspx) ; Working Group on Oceanic Hydrography (http://www.ices.dk/community/groups/Pages/WGOH.aspx); Working Group on Phytoplankton and Microbial Ecology 9 (http://www.ices.dk/community/groups/Pages/WGPME.aspx); Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (http://www.ices.dk/community/groups/Pages/WGRECORDS.aspx) ; Working Group on Seabird Ecology (http://www.ices.dk/community/groups/Pages/WGSE.aspx) Working Group on Small Pelagic Fish, their Ecosystems and Climate Impact (http://www.ices.dk/community/groups/Pages/WGSPEC.aspx) ; Working Group on Zooplankton Ecology (http://www.ices.dk/community/groups/Pages/WGZE.aspx) .</p>	<p>Mission: To advance the scientific understanding of marine ecosystems, and provide information, knowledge, and advice on the sustainable management of human activities affecting, and affected by, marine ecosystems.</p> <p>Vision: To be a world leading scientific organization concerning marine ecosystems and to provide the knowledge to secure the sustainable use of the seas.</p> <div><p>The ICES Strategic Plan – four pillars and seven goals</p><p>The infographic illustrates the ICES Strategic Plan, structured around four pillars and seven goals. The pillars are: 1. SCIENCE COMMITTEE (Building a foundation of science), 2. ADVISORY COMMITTEE (Producing the information and advice decision-makers need), 3. DATA & INFORMATION SERVICES (Underpinning science and advice through data and information services), and 4. SECRETARIAT (Supporting the organization through the work of the Secretariat). The seven goals are: GOAL 1 (Develop an integrated, interdisciplinary understanding of the structure, dynamics, and the resilience and response of marine ecosystems to change), GOAL 2 (Understand the relationship between human activities and marine ecosystems, estimate pressures and impacts, and develop science-based, sustainable pathways), GOAL 3 (Evaluate and advise on options for the sustainable use and protection of marine ecosystems), GOAL 4 (Promote the advancement of data and information services for science and advice needs), GOAL 5 (Catalyse best practices in marine data management, and promote the ICES data model as a global resource), GOAL 6 (Foster the science, advisory, data and information services through the work of the Secretariat), and GOAL 7 (Ensure an efficient and effective organization).</p></div>

ToR 1 To summarise the main elements of the EU Maritime Strategy for the Atlantic Ocean Area and the subsequent Action Plan for the Maritime Strategy in the Atlantic Area, transatlantic cooperation agreements and initiatives (an example of the latter; the Galway Statement on Atlantic Ocean Cooperation), bilateral cooperation agreements, and any other relevant Atlantic research and cooperation agreements.		ToR 2 To summarise existing ICES work and other relevant work carried out by ICES Member Countries in the area of maritime transatlantic cooperation, by reference to the agreements and initiatives summarised under ToR 1.	ToR 3 To describe how the ICES cooperation structure could be used to facilitate and promote work under transatlantic cooperation agreements using the outputs from ToRs 1 and 2, including ICES position in relation to Horizon 2020 calls (e.g., BG-14-2014 “Supporting cooperation initiatives: Atlantic Ocean Cooperation Research Alliance”).	ToR 4 To identify new opportunities for trans-Atlantic marine science and research, that ICES could engage in to support the implementation of the ICES Strategic Plan, through the ICES network (expert groups, projects, databases, etc.), or by fostering strategic partnerships.
Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
				<div>Understand the relationship between human activities and marine ecosystems, estimate pressures and impacts, and develop science-based, sustainable pathways</div> <div>Goal 3</div> <div></div> <div>nd</div>
	Sustainable exploitation of the Atlantic seafloor's natural resources, including (highlights): - access to data	The aim of ICES Ecosystems Pressures and Impacts (EPI) element is to: Understand the relationship between human activities and marine ecosystems , estimate pressures and impacts and develop science-based sustainable pathways. Provide tools and methods for assessing the relationship between marine ecosystems, their biological resources and habitats, and human societies, including how human use impacts the provision of ecosystem services .	ICES Ecosystem Pressures and Impacts (SSGEPI) Marine Chemistry Working Group (http://www.ices.dk/community/groups/Pages/MCWG.aspx) ; Study Group on Socio-Economic Dimensions of Aquaculture (http://www.ices.dk/community/groups/Pages/SGSA.aspx) ; Strategic Initiative Group for MSP (http://www.ices.dk/community/groups/Pages/STIGMSP.aspx); Working Group on Application of Genetics in Fisheries and Mariculture (http://www.ices.dk/community/groups/Pages/WGAGFM.aspx)); Working Group on Aquaculture (http://www.ices.dk/community/groups/Pages/WGAQUA.aspx) ; Working Group on Biological Effects of Contaminants (http://www.ices.dk/community/groups/Pages/WGBEC.aspx) ; Working Group on the Effects of Extraction of Marine Sediments on the Marine Ecosystem (http://www.ices.dk/community/groups/Pages/WGEXT.aspx); ICES - IOC Working Group on Harmful Algal Bloom Dynamics (http://www.ices.dk/community/groups/Pages/WGHABD.aspx); Working Group for Marine Planning and Coastal Zone Management	Integrated ecosystem understanding/Integrated ecosystem assessments Building the foundation of science around integrated ecosystem understanding, with the aim to produce Integrated ecosystem assessments in regional seas as a fundamental link between ecosystem science and the advice required in applying the ecosystem approach

ToR 1		ToR 2	ToR 3	ToR 4
To summarise the main elements of the EU Maritime Strategy for the Atlantic Ocean Area and the subsequent Action Plan for the Maritime Strategy in the Atlantic Area, transatlantic cooperation agreements and initiatives (an example of the latter; the Galway Statement on Atlantic Ocean Cooperation), bilateral cooperation agreements, and any other relevant Atlantic research and cooperation agreements.		To summarise existing ICES work and other relevant work carried out by ICES Member Countries in the area of maritime transatlantic cooperation, by reference to the agreements and initiatives summarised under ToR 1.	To describe how the ICES cooperation structure could be used to facilitate and promote work under transatlantic cooperation agreements using the outputs from ToRs 1 and 2, including ICES position in relation to Horizon 2020 calls (e.g., BG-14-2014 "Supporting cooperation initiatives: Atlantic Ocean Cooperation Research Alliance").	To identify new opportunities for trans-Atlantic marine science and research, that ICES could engage in to support the implementation of the ICES Strategic Plan, through the ICES network (expert groups, projects, databases, etc.), or by fostering strategic partnerships.
Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
			http://www.ices.dk/community/groups/Pages/WGMPCZM.aspx); ; Working Group on Marine Renewable Energy http://www.ices.dk/community/groups/Pages/WGMRE.aspx); Working Group on Marine Sediments in Relation to Pollution http://www.ices.dk/community/groups/Pages/WGMS.aspx); Working Group on Pathology and Diseases of Marine Organisms http://www.ices.dk/community/groups/Pages/WGPDMO.aspx) ; Working Group on Resilience and Marine Ecosystem Services http://www.ices.dk/community/groups/Pages/WGRMES.aspx)	
EU Action Plan, 2014-2020 (Action Plan for a Maritime Strategy in the Atlantic area Delivering smart, sustainable and inclusive growth, 2013)	<p><u>Thematic objective:</u> Increasing the capacity for research and innovation through education and training and bringing industry closer to research</p> <p><u>Target areas:</u></p> <ul style="list-style-type: none"> Research on ocean governance, the sustainable exploitation and management of marine resources, ... marine environmental protection Requiring data, modelling, forecast and prediction <p><u>Priorities:</u> Networking, cooperative research Multi-species modelling, discards, by-catch Environmental sustainability of aquaculture Invasive/harmful marine species Surveys, observations/new</p>	<p>The aim for ICES Integrated Ecosystem Observation and Monitoring (IEOM) is to: Provide a structure and vision for coordinated, targeted and cost-effective data collection systems in ICES. These systems will support both scientific and advisory needs, and provide strong links between ICES, national data centres, and other organizations. The aim of this process is to: Ensure the effective transfer and application of innovative and relevant science into sound, credible and responsive advice, including:</p> <p>Estimate long-term trends of human impacts on marine ecosystems: - Develop historical baselines of population and community structure and production to be used as the basis for population and system level reference points.</p> <p>Understand, quantify and mitigate multiple impacts of human activity on populations and ecosystems: - Develop methods to quantify multiple direct and indirect impacts, particularly from fisheries, as well as mineral extraction, energy generation, aquaculture practices and others, and estimate the vulnerability of marine ecosystems to these impacts. - Develop understanding to mitigate impacts from these activities, particularly reduction of non-target mortalities, as well as habitat loss or enhancement, and their effects on populations of marine organisms. - Develop indicators of pressure on populations and ecosystems from human threats such as eutrophication, contaminant and litter release, introduction of invasive species and generation of underwater noise.</p> <p>Provide evidence in support of the sustainable management of ecosystem goods and services: - Evaluate trade-offs between ecosystem protection and sustainable resource use in the management of human activity. - Develop tactical and strategic models to support short- and long-term fisheries management and governance advice, increasingly incorporating spatial</p>	<p>ICES Integrated Ecosystem Observation and Monitoring (SSGIEOM) International Bottom Trawl Survey Working Group http://www.ices.dk/community/groups/Pages/IBTSWG.aspx); Joint Workshop of the ICES-FAO Working Group on Fishing Technology and Fish Behaviour http://www.ices.dk/community/groups/Pages/JFATB.aspx) ; Working Group on Fisheries Acoustics Science and Technology http://www.ices.dk/community/groups/Pages/WGFAST.aspx) ; Study Group on Electrical Trawling http://www.ices.dk/community/groups/Pages/WGELECTRA.aspx); Study Group on Turned 90° Codend Selectivity, focusing on Baltic Cod Selectivity http://www.ices.dk/community/groups/Pages/SGTCOD.aspx); Working Group on Acoustic and Egg Surveys for Sardine and Anchovy in ICES areas VIII and IX http://www.ices.dk/community/groups/Pages/WGACEGG.aspx); Working Group on Atlantic Fish Larvae and Eggs Surveys http://www.ices.dk/community/groups/Pages/WGALES.aspx); Working Group on Beam Trawl Surveys http://www.ices.dk/community/groups/Pages/WGBEAM.aspx); Baltic International Fish Survey Working Group http://www.ices.dk/community/groups/Pages/WGBIFS.aspx); Working Group 2 on North Sea Cod and Plaice Egg Surveys in the North Sea http://www.ices.dk/community/groups/Pages/WGEGGS2.aspx); ICES - FAO Working Group on Fishing Technology and Fish Behaviour(http://www.ices.dk/community/groups/Pages/WGFTFB.aspx) ; Working Group on International Deep Pelagic Ecosystem Surveys http://www.ices.dk/community/groups/Pages/WGIDEEPS.aspx); Working Group of International Pelagic Surveys http://www.ices.dk/community/groups/Pages/WGIPS.aspx); Working Group on Improving use of Survey Data for Assessment and Advice</p>	<p>Arctic The Arctic marine ecosystem will undergo major changes in the coming decades due to ongoing climate change and increasing human activities. The ecological changes will be complex, including increases in biological productivity, losses and gains of individual species and changes in food web structure. ICES contributes to Arctic research through a number of working groups that focus on ecosystem components such as zooplankton ecology, and subarctic fish stocks. Our efforts are expanding to address several other issues including hydrography and warming of the Arctic Ocean, modelling of biological consequences of a decrease in sea ice, and evaluating the environmental risks of oil and gas exploitation and shipping, including the spreading of non-native species. The Arctic offers ICES the opportunity to cooperate with international science organizations in several key areas, such as integrated observing systems and ecosystem assessments, survey coordination and marine spatial planning.</p>

ToR 1		ToR 2	ToR 3	ToR 4
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<i>Programmes/Strategies/Agreements</i>	<i>Priorities/Topics</i>	<i>ICES work</i>		
	instruments and platforms Interoperable marine data distribution Marine environmental protection/ Good Environmental Status (GES)	components in the management of habitats and populations of exploited species. - Quantify and map biological, ecological and environmental value, optimise ecosystem use and minimise environmental impact, in relation to a dynamic ecosystem carrying capacity. - Develop science in support of advisory needs on sustainable marine aquaculture systems, minimising environmental impacts and integrating other marine sectors.	http://www.ices.dk/community/groups/Pages/WGISDAA.aspx ; Working Group on Integrating Surveys for the Ecosystem Approach http://www.ices.dk/community/groups/Pages/WGISUR.aspx ; Working Group on Mackerel and Horse Mackerel Egg Surveys http://www.ices.dk/community/groups/Pages/WGMEGS.aspx ; Working Group for North-east Atlantic Continental Slope Survey http://www.ices.dk/community/groups/Pages/WGNEACS.aspx ; Working Group on Nephrops Surveys http://www.ices.dk/community/groups/Pages/WGNEPS.aspx ; Working Group on Target Classification http://www.ices.dk/community/groups/Pages/WGTC.aspx ;	
		<p>The aim for Integrated Ecosystem Assessments IEAs is to: Maximize their use in scientific and advisory contexts. This involves the development of a flexible and inclusive approach that allows the use of both qualitative and quantitative data and answers to issue-based advisory questions as well as broader ecosystem quality diagnoses. This includes:</p> <p>Develop consensual objectives for IEA in ICES regional seas in response to current and future scientific and advisory needs:</p> <ul style="list-style-type: none"> - Identify objectives for a holistic IEA in relation to ecosystem stability and health, according to ecological, social and economic sustainability goals, and recognising multi-scale issues. - Identify issue-based ecosystem questions that can be provided by the development of IEA, relevant to science and management needs. - Provide priorities and specifications for data collection frameworks supporting IEAs. <p>Advance an IEA methodology and approach in the ICES context:</p> <ul style="list-style-type: none"> - Conduct pilot studies in data-rich areas for alternative IEA approaches, linking qualitative and quantitative methods at appropriate spatial and temporal scales. <p>Develop approaches that will allow forecasting within an IEA and evaluation of the effectiveness and trade-offs of alternative management options.</p> <ul style="list-style-type: none"> - Determine and demonstrate what modelling and analytical approaches would allow of projections for ecosystem state in IEA. - Use of IEA to assist in the management of cumulative pressures, additive and non-additive impacts, including analysis of trade-offs between sectoral objectives, and the inclusion of risk evaluations. - Comparisons of IEA and single-issue approaches in terms of their utility to inform management and governance advice on sectoral and multi-sectoral use of the oceans. 	<p>ICES Integrated Ecosystem Assessments (SSGIEA) Study Group on Integration of Economics, Stock Assessment and Fisheries Management; Study Group on Spatial Analyses for the Baltic Sea http://www.ices.dk/community/groups/Pages/SGSPATIAL.aspx; Working Group on Comparative Analyses between European Atlantic and Mediterranean marine ecosystems to move towards an Ecosystem-based Approach to Fisheries http://www.ices.dk/community/groups/Pages/WGCOMEDA.aspx; Working Group on Ecosystem Assessment of Western European Shelf Seas http://www.ices.dk/community/groups/Pages/WGEAWESS.aspx) ; ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea http://www.ices.dk/community/groups/Pages/WGIAB.aspx; Working Group on the Integrated Assessments of the Barents Sea http://www.ices.dk/community/groups/Pages/WGIBAR.aspx ; Working Group on the Integrated Assessments of the Norwegian Sea http://www.ices.dk/community/groups/Pages/WGINOR.aspx; Working Group on Integrated Assessments of the North Sea http://www.ices.dk/community/groups/Pages/WGINOSE.aspx; Working Group on Large Marine Ecosystem Programme Best Practices http://www.ices.dk/community/groups/Pages/WGLMEBP.aspx </p>	<p>Aquaculture Aquaculture is the world’s fastest growing food production sector presenting a spectrum of challenges for scientists and advisors working towards its sustainable management. ICES helps governments develop criteria for sustainable aquaculture production which informs and facilitates the management of aquaculture on a national level as well as provides scientific advice for international environmental standards. ICES addresses both biological and environmental issues such as sea lice, pest and predator management, interactions between wild and farmed fish, and the impacts of climate change.</p>

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Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
		<p>Ensure the effective transfer and application of innovative and relevant science into sound, credible and responsive advice.</p> <p>This process will use quantitative and qualitative data, models and knowledge and bring these through a transparent, quality-assured process to conduct operational IEA assessments. The following objectives are pursued:</p> <ul style="list-style-type: none"> - Establish a multiple tier process for benchmarks of ecosystems and ecosystem sub-components assessments in ICES regional seas. - Engage with science and advisory expert groups to identify concepts, methodologies, models and data of relevance to the bench-marking process. - Develop a process to translate these concepts and methodologies into benchmarking products and outputs to a standard applicable to routine assessments, based on comprehensive evaluation of costs and benefits. - Establish a scoping process to include stakeholders. - Establish an evaluation scheme to measure the efficiency of the up-take of best available science into routine assessments and the delivery of advice. - Engage with research funding agencies and academia to ensure that new science can be incorporated into the advisory process 	ICES Benchmarking Steering Group (BSSG)	<p>Training programme.</p> <p>ICES Training Programme offers courses by high-profile scientists and instructors.</p> <p>The Training Programme:</p> <ul style="list-style-type: none"> • ensures that participants in Expert Groups and other parts of the scientific and advisory process have the skills needed to deliver high quality advice; • ensures a common understanding of ICES advisory practice • disseminates insight throughout the ICES community and beyond • intensifies cooperation with expertise from other organizations to introduce new disciplines and perspectives to ICES science and advice.
		<p>The Strategic Initiative on Biodiversity Advice and Science (SIBAS) deals with:</p> <ul style="list-style-type: none"> -response to immediate political drivers and promotion of ICES capacity; - Co-ordination, and provision of a forum for, scientific research to address biodiversity issues. <p>SIBAS aims to:</p> <ul style="list-style-type: none"> - advance biodiversity science and advice through effective utilization of internal resources by steering of the work of various ICES expert groups, and communication with external research communities and stakeholder groups; - position ICES to ensure that it is regarded as an effective and reliable source of biodiversity advice; - ensure development and promotion of the linkage of marine biodiversity science and advice. <p>SIBAS goals will be achieved through close cooperation with the ICES Member States, regional marine management bodies, international organisations/initiatives and external international research networks.</p>	<p>ICES Strategic initiative on Biodiversity Science and Advice (SIBAS)</p> <p>World Conference on Marine Biodiversity (Qingdao, China, 12–16 3)October 2014): ICES suggested special session on ‘Linking marine biodiversity science and advice’ (co-chairs H. Ojaveer, P. Snelgrove and T Crowe) was accepted. http://wcmb2014.csp.escience.cn/dct/page/70021</p> <p>Cooperation with CIESM and PICES on bioinvasions:</p> <p>ICES ASC 2014 Theme Session on ‘The increasing importance of biofouling for marine invasions: an ecosystem altering mechanism’ (co-conveners Andrea Sneekes, (the Netherlands), Francis Kerckhof (Belgium), and Thomas Therriault (PICES, Canada));</p> <p>ICES-CIESM alien species cooperation meeting and starting to carry forward the joint activity planned for 2014 (<i>Mnemiopsis leidyi</i> workshop). The draft terms of reference were agreed, the suggested co-chair identified (Annex 4) and the information was now passed on to CIESM.</p>	Outreach

ToR 1		ToR 2	ToR 3	ToR 4
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Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
			Cooperation with PICES could have two components: data exchange and joint sessions at International Marine Bioinvasions Conference series (the next will be in Sydney, Australia in 2015). Dialogue to be continued intersessionally and at the ICES ASC 2014.	
Galway Statement, 2013 (Galway Statement on Atlantic Ocean Cooperation Launching a Canada-European Union- United States of America Research Alliance)	<p>Cooperation to:</p> <ul style="list-style-type: none"> Align ocean observations Better coordinate 1) data sharing, 2) observing infrastructures and 3) seabed and benthic habitat mapping <p>Leading to:</p> <ul style="list-style-type: none"> Better 1) ecosystem assessments 2) forecasts and understanding of vulnerabilities and risks, including global climate system/climate change impacts 3) new tools (for, e.g., increased resilience, conservation for rich biodiversity etc.) <p>Also intended for:</p> <ul style="list-style-type: none"> Promote citizens understanding of value of Atlantic through oceans literacy 	<p>The Strategic Initiative on Climate Change Impacts on Marine Ecosystems 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.</p> <p>The objectives of this strategic initiative are:</p> <p>To advance the scientific capacity on the three main challenges identified above by engaging the PICES and ICES scientific community in focused workshops, theme/topic sessions and symposia that target key uncertainties and technical barriers that impact the predictive skill of ocean models used to project the impacts of climate change.</p> <p>To effectively communicate this capacity to clients, Member Countries, stakeholders and the broader scientific community.</p> <p>To facilitating an international effort to design data collection networks at the spatial and temporal scales needed to monitor, assess and project climate change impacts on marine ecosystems.</p> <p>To facilitate international collaboration to design and implement comparative analysis of marine ecosystem responses to climate change through modelling and coordinated process studies.</p> <p>e.g. PICES/ICES/IOC Symposium on <i>Effects of climate change on the world's oceans</i> (May 2012, Yeosu, Korea).</p> <p>2013 PICES/ICES Intersessional Workshop on <i>Global Assessment of the Implications of Climate Change on the Spatial Distribution of Fish and Fisheries</i>, May 22-24, St. Petersburg, Russia</p> <p>PICES/ICES/IOC Third International Symposium on <i>Effects of Climate Change on the World's Oceans</i>, taking place 23-27 March 2015 in Santos, Brazil</p>	<p>ICES-PICES Strategic Initiative on Climate Change Impacts on Marine Ecosystems (SICCME)</p> <p>Phase 2: 2015-2017</p> <p>Continue to advance new science focused on climate change effects on marine ecosystems through theme/topic sessions and workshops;</p> <p>Update and improve forecasts with IPCC AR5 scenarios;</p> <p>Convene an international symposium in 2016;</p> <p>Develop regional synthesis reports;</p> <p>Initiate inter-sessional training for projecting climate change impacts on marine ecosystems;</p> <p>Continue collaboration with global climate change research community.</p> <p>Phase 3: 2018-2020</p> <p>Continue to advance new science focused on climate change effects on marine ecosystems through theme/topic Sessions and workshops;</p> <p>Update and improve predictions with IPCC AR6 scenarios;</p> <p>Develop regional synthesis reports;</p> <p>Convene an international symposium in 2018.</p>	Cooperation with strategic partners, to ensure added value and most efficient use of resources

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Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
		<p>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.</p> <p>The material presented at the WGOH meetings each year is consolidated and published as the annual ICES Report on Ocean Climate (IROC; http://www.ices.dk/sites/pub/Publication%20Reports/Cooperative%20Research%20Report%20(CRR)/crr321/IROC%202012.pdf).</p> <p>With the IROC, the Working Group analyses multiple time-series in a consistent way to give an overview of the state-of-the-environment in the North Atlantic.</p>		
Report of the Scientific workshop (Galway Statement on Atlantic Ocean Cooperation – Report of the Scientific workshop)	<p><u>Common objectives, based on key challenges and leading to recommendations:</u></p> <p>Objective: An enhanced predictive capacity for the major risks and changes in the dynamics of the North Atlantic Ocean, its ecology, circulation system, interactions between the Atlantic and Arctic as well as ocean-atmosphere connections; <u>Challenges:</u> The integration of historical and paleo data, ocean observing and forecasting systems to provide better indicators of past, current and future environmental status Advance existing technologies (including approaches emerging from other disciplines), ecosystem and biogeochemical models, as well as developing empirical and modelling</p>	<p>The Strategic Initiative for Stock Assessment Methods (SISAM) is designed to ensure that scientists can apply the best stock assessment methods when developing management advice for fisheries management.</p> <p>The World Conference on Stock Assessment Methods for Sustainable Fisheries (15-19 July 2013).</p> <p>Ecosystem Studies of Sub-Arctic Seas (ESSAS) Annual Science Meeting, April 7-9, 2014, Copenhagen.</p> <p>Physical and biological consequences of North Atlantic circulation patterns; Theme Session Q, ICES ASC, Spain, 2014.</p> <p>PICES FUTURE Open Science meeting April 15-18, 2014, Hawaii.</p> <p>PICES 2014 Annual Science Meeting, Korea, 11 or 12 October.</p>	ICES Strategic Initiative Stock assessment methods (SISAM)	

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Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
	approaches to enable the quantification of evolutionary change in ocean systems ; Standardisation of sampling and observation techniques, common data standards and harmonised habitat classification systems to facilitate open data access and the use and reuse of data . <u>Recommendations:</u>			
	<u>Objective:</u> Based on existing and new capability, to have implemented a fit for purpose North Atlantic multi-platform ocean observing and forecasting system driven by science and societal needs and providing real time data and long term time series; <u>Challenges:</u> Mainstreaming of cost effective chemical and biological (including genomic) sensors as well as robotic and autonomous systems for ocean observation; <u>Recommendations:</u>	ICES Advisory work The basic principles are threefold: 1) Peer review of scientific analysis should always take place, based on the same principles of independence and competence as used by scientific journals, 2) the translation of scientific analysis into operational advice should be done under the control of an international board of scientists representing all member countries in ICES, including members with no interest in the specific matter and finally 3) all outcomes from each step is entirely transparent by being publicly available on the ICES web page. Advice is provided on : <ul style="list-style-type: none">• >200 fish stocks annually• Multi-species/mixed fisheries considerations• Vulnerable Marine Areas and Ecological and Biological Significant Areas• Introduction and transfer of marine organisms, measures for reducing risk of spreading of non-native species via shipping activities		
	<u>Objective:</u> Mapped the Atlantic to underpin the accuracy of predictive models and forecasts and identified key tectonic /volcanic sites , as well as	ICES data and information work ICES, through its work to provide best available scientific knowledge and advice to the North East Atlantic and adjacent area, have a well-established Data Centre. The ICES Data Centre manages a number of large dataset collections related to the marine environment covering the NE Atlantic, Baltic Sea, Greenland Sea and Norwegian Sea. The data	The Data and Information group (DIG) provides ICES with advice on all aspects of data management including data policy, data strategy, data quality, technical issues and user-oriented guidance. There is a close link between DIG and ICES Data Centre, as DIG supports ICES Data Centre with feedback and advice on a number of topics, including existing products, current developments,	

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Programmes/Strategies/Agreements	Priorities/Topics	ICES work																																		
	<p>ecologically and economically important (and potentially undiscovered) seafloor and water column habitats;</p> <p><u>Challenges:</u> Quantify the effects of multiple stressors on biogeochemistry, organisms and ecosystem</p> <p><u>Recommendations:</u></p>	<p>originate from national institutes that are part of the ICES network of member countries that include all countries bordering the NE Atlantic and Baltic Seas.</p> <p>The data are primarily related to national monitoring programmes and associated to a number of thematic areas including Fisheries, environmental pollution and effects, biodiversity and the physical conditions of the sea and seabed.</p> <p>The Data Centre holds contracts with the regional sea conventions (HELCOM and OSPAR), as well as the European Environment Agency (EEA) to manage marine datasets on their behalf. Data coming into the ICES dataset collections undergoes a number of automated checks including checks on format, required information, range checks, valid references, outliers and cross-references. In addition a number of visual checks are made by the data managers, before the data is released to the data portals. Because the data portals are specifically used for a number of regional assessments related to the Regional Sea Conventions and the Data Collection Framework, a continuous check and feedback on data are made by these users.</p> <p>ICES organises these dataset collections around specific thematic data portals, as well as an overarching data warehouse. The table below is a summary of the information that can be visualised and downloaded in the ICES Data Portal</p> <table><tr><th>Dataset Collection</th><th>No of Measurements</th><th>No of years</th><th>No of Parameters/<i>Taxa</i></th></tr><tr><td>Oceanographic</td><td>245,470,249</td><td>122</td><td>18</td></tr><tr><td>Contaminants and biological effects</td><td>9,486,537</td><td>36</td><td>646</td></tr><tr><td>Eggs and Larvae</td><td>996, 282</td><td>91</td><td></td></tr><tr><td>Fish trawl survey</td><td>5,616,258</td><td>49</td><td>489</td></tr><tr><td>Fish predation (stomach contents)</td><td>1,149,608</td><td>12</td><td>845</td></tr><tr><td>Biological community</td><td>692,213</td><td>34</td><td>2,200</td></tr><tr><td>ICES Historical Plankton</td><td>318,319</td><td>11</td><td>1,985</td></tr></table> <p>Other portals and services</p> <p>Web services have been developed around a number of generic queries, as well as some more specific applications, such as the platform code service for SeaDataNet, and the Species records for EMODNet Biology. A shortlist can be found on each web portal that has services, and also on the Web services page http://www.ices.dk/marine-data/tools/Pages/WebServices.aspx</p> <p>Controlled Vocabularies are integral to all of the ICES dataset collections and are managed and maintained through the</p>	Dataset Collection	No of Measurements	No of years	No of Parameters/ <i>Taxa</i>	Oceanographic	245,470,249	122	18	Contaminants and biological effects	9,486,537	36	646	Eggs and Larvae	996, 282	91		Fish trawl survey	5,616,258	49	489	Fish predation (stomach contents)	1,149,608	12	845	Biological community	692,213	34	2,200	ICES Historical Plankton	318,319	11	1,985	<p>potential new products, and the potential risk of data-duplication resulting from multiple submission roots, and the evaluation of the checklists.</p> <p>ICES has just been accredited with Associated Data Unit (ADU) status within</p> <p>the Intergovernmental Oceanographic Commissions (IOC) marine data</p> <p>programme, the International Oceanographic Data and Information Exchange</p> <p>(IODE).</p>	
Dataset Collection	No of Measurements	No of years	No of Parameters/ <i>Taxa</i>																																	
Oceanographic	245,470,249	122	18																																	
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		<p>http://vocab.ices.dk web page. In addition, specific applications have been made for more specialised cases, such as the SeaDataNet platform request and management system http://admin.ices.dk/requests/.</p> <p>Where possible, ICES uses established vocabularies and uses their services to ensure minimum duplication of effort i.e. species names are managed through the World Register of Marine Species (WoRMS).</p> <p>Spatial data: In addition to the specific data portal application, ICES has a spatial facility http://www.ices.dk/marine-data/maps/Pages/default.aspx for both managing, distributing and viewing spatial data layers as well as cataloguing and discovery services for metadata related to ICES datasets and ICES working group and client data products. This portal is built on the open source geo-server and geo-network architecture.</p> <p>Data policy</p> <p>ICES has a well established and open access minded data policy http://www.ices.dk/marine-data/guidelines-and-policy/Pages/ICES-data-policy.aspx. ICES expect that users of the data can download or gain access to the data by just accepting the policy (usually by a mouse click) and no registration or questions are levied at the user. In return, the user is obliged to duly acknowledge the dataset source and also report back to ICES should they discover potential issues with the data.</p>		
	<p><u>Objective:</u> Enabled the safest operational and risk management environment for operation at sea as well as for offshore and coastal users;</p> <p><u>Challenges:</u> Determine the mechanisms initiating hazardous events and identify indicators to improve the forecast of the spatial-temporal occurrence of these events;</p>			

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Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
	<u>Recommendations:</u>			
	<u>Objective:</u> Forged greatly strengthened collaborative operational and scientific undertakings of mutual benefit and integrated these activates seamlessly across the North Atlantic between Europe and the North Americas; <u>Challenges:</u> Develop and maintain the capacity for rapid response to unanticipated and episodic events that require immediate scientific investigation to advance knowledge; <u>Recommendations:</u>			
	<u>Objective:</u> Supported the development, through public, academic and private sector partnerships (e.g. clusters of innovation), of a range of new and innovative knowledge based and globally traded products and services, including novel observing technologies and innovation to promote new opportunities for			

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	<p>sustainable socio-economic growth;</p> <p><u>Challenges:</u> Build an industry, academia and government cross sector vision of a shared data collection, management and information infrastructure;</p> <p><u>Recommendations:</u></p>			
	<p><u>Objective:</u> Revolutionised our understanding of the role of the North Atlantic in earth system dynamics, especially with respect to interactions with coastal zones and with the Arctic, Central Atlantic and Mediterranean;</p> <p><u>Challenges:</u> Engage with existing international networks (e.g. GEO – Blue Planet Initiative) to set the Atlantic in a global context;</p> <p><u>Recommendations:</u></p>			
	<p><u>Objective:</u> Promoted ocean literacy, engaged with societal stakeholders (including citizen participation) and inspired and educated the next generation of trans-disciplinary scientists and engineers.</p>			

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Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
	<div>Challenges:</div> <div>Evaluate the role of biodiversity in the health and functioning of ecosystems and the maintenance of ecosystem services;</div> <div>Recommendations:</div>			
	<div>Recommendations:</div> <div><ul style="list-style-type: none">elaborate and distil the many suggestions put forward at the Conference and further refine a set of key Atlantic / Arctic scientific challenges that would benefit from a joint approach;evaluate the basis for and feasibility of a jointly funded and competitive research programme to address North Atlantic research issues of mutual interest;undertake a more detailed review of existing North Atlantic ocean observation capacities, address identified gaps and challenges and deliver the required predictive capacity by 2020;</div>			

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	<ul style="list-style-type: none">establish mechanisms to promote trans-Atlantic data sharing, using as a test case seabed mapping;make recommendations on the optimum approach to habitat mapping such that mapping initiatives, carried out separately or jointly, can be seamlessly merged. This will include a review of existing and emerging mapping techniques, common standards and habitat classification systems; examine options for trans-Atlantic joint actions on ocean literacy and engagement with societal stakeholders .			
Canada	<ul style="list-style-type: none">			
Canada–EU Partnership Agenda	<p>Cooperating on <u>Global and Regional Challenges</u>, includes:</p> <ul style="list-style-type: none">Canada and the EU will work towards common conservation objectives in regional fisheries management organisations like the North West Atlantic Fisheries Organisation.		Canada made a statement of support on ICES participation in project of H2020, and specifically on projects related to transatlantic cooperation: " Canada supports Trans-Atlantic Cooperation activities including the involvement of participants, such as the International Council for the Exploration of the Sea (ICES), in the EU Horizon 2020 research project BG-14-2014 (Supporting international cooperation initiatives: Atlantic Ocean Cooperation Research Alliance). "	

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Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
	<ul style="list-style-type: none">Canada and the EU will maintain an open and transparent dialogue on fisheries issues with all parties concerned including the fisheries industry. Our dialogue will take into account international instruments such as the United Nations Convention on the Law of the Sea and the United Nations Agreement on Straddling and Highly Migratory Stocks.Canada and the EU have shared interests and concerns in the North, as stated in our 1999 Joint Statement on Northern Cooperation. This Canada-EU Statement has been the framework that guides our cooperation in the North. The EU's and Canada's Northern dimension policies recognise each other as key partners in the North. In the context of the Northern Dimension, Canada and the EU will:<ul style="list-style-type: none">- identify and pursue coordinated actions in the field of the environment including			

ToR 1		ToR 2	ToR 3	ToR 4
To summarise the main elements of the EU Maritime Strategy for the Atlantic Ocean Area and the subsequent Action Plan for the Maritime Strategy in the Atlantic Area, transatlantic cooperation agreements and initiatives (an example of the latter; the Galway Statement on Atlantic Ocean Cooperation), bilateral cooperation agreements, and any other relevant Atlantic research and cooperation agreements.		To summarise existing ICES work and other relevant work carried out by ICES Member Countries in the area of maritime transatlantic cooperation, by reference to the agreements and initiatives summarised under ToR 1.	To describe how the ICES cooperation structure could be used to facilitate and promote work under transatlantic cooperation agreements using the outputs from ToRs 1 and 2, including ICES position in relation to Horizon 2020 calls (e.g., BG-14-2014 “Supporting cooperation initiatives: Atlantic Ocean Cooperation Research Alliance”).	To identify new opportunities for trans-Atlantic marine science and research, that ICES could engage in to support the implementation of the ICES Strategic Plan, through the ICES network (expert groups, projects, databases, etc.), or by fostering strategic partnerships.
<i>Programmes/Strategies/Agreements</i>	<i>Priorities/Topics</i>	<i>ICES work</i>		
	climate change, sustainable development and trans-boundary pollutants , especially through the EU Northern Dimension Environmental Partnership			
Canada and EU Agreement for Scientific and Technological Cooperation, 1996	Agriculture including fisheries; environment, including earth observation;			
Canadian Atlantic Ocean Monitoring		The Atlantic Zone Monitoring Program in Atlantic Canada was developed with the aim of collecting and analyzing the biological, chemical, and physical data to detect and monitor seasonal and inter-annual variability in Eastern Canadian waters.		
Fisheries and Oceans Canada Five-Year Research Agenda (2007-2012)		Fish Population and Community Productivity; Habitat and Population Linkages; Climate Change / Variability; Ecosystem Assessment and Management Strategies; Aquatic Invasive Species; Aquatic Animal Health; Sustainability of Aquaculture; Ecosystem Effects of Energy Production; Operational Oceanography; Emerging and Enabling Technologies for Regulatory and Policy Responsibilities		
<i>Ireland</i>				
US National Oceanic and Atmospheric Institute (NOAA) and the Marine Institute on Marine Resource Management, Signed 1995 not limited.		Coordination and co-operation in respect of resource management and management-oriented research collaboration; resource mapping and management programmes for Ireland’s EEZ and technology and instrumentation		
Marine Institute Ireland and Memorial University of Newfoundland (Canada) and on Fisheries and Ecosystem Science:		Cooperation between fisheries and oceanographic related survey activities, charter of the RV Celtic Explorer (Marine Institute) to Memorial University of Newfoundland.		
NEPTUNE (Canada), Ocean Networks Canada, University of Victoria and the Marine Institute Ireland on Ocean Observatories:		Reciprocal research and educational experiences for researcher, faculty, students and employees, Uvic/SmartBay/CELNET visiting researcher status, staff secondments.		
<i>United Kingdom</i>				
UK Natural Environment Research Council, NERC		Arctic Research Programme; Biodiversity and Ecosystem Service Sustainability (BESS)		

ToR 1		ToR 2	ToR 3	ToR 4
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Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
(largest funder of independent environmental science, training and innovation, delivered through universities and research centres)				
USA		Through the RAPID and RAPIDWATCH programmes NERC collaborates with the US National Science Foundation (NSF) and National Oceanographic and Atmospheric Administration (NOAA) to co-deliver an array of sensors across the Atlantic to monitor and understand changes to the Atlantic Meridional Overturning Circulation The financial value of funds leveraged through this partnership, currently agreed until 2020, is estimated at \$20m.		
SCIENTIFIC AND TECHNOLOGICAL COOPERATION Agreement Between the UNITED STATES OF AMERICA and the EUROPEAN COMMUNITY	Environment (including climate research); fisheries science; natural resources; material sciences and metrology; biotechnology		The USA made a statement of support on ICES participation in project of H2020, and specifically on projects related to transatlantic cooperation: " The U.S. supports Transatlantic Cooperation activities including the involvement of participants, such as the International Council for the Exploration of the Sea (ICES), in the EU Horizon 2020 research project BG-14-2014 (Supporting international cooperation initiatives: Atlantic Ocean Cooperation Research Alliance). "	
European Union–United States Joint Consultative Group Marine Working Group (Press release)	Oceans stressors; aquaculture; observing systems; marine microbial ecology; ocean literacy			
US National Ocean policy		1. Ecosystem -based Management 2.Coastal and Marine Spatial Planning 3. Inform Decisions and Improve Understanding 4. Coordinate and Support Management 5.Resiliency and Adaptation to Climate change and Ocean Acidification 6. Regional Ecosystem Protection and Restoration 7.Water Quality and Sustainable Practices on Land 8.Changing Conditions in the Arctic 9.Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure		
Norway Strategy for Norway's Scientific and Technological Cooperation with North America		Marine research and technology, including the production of seafood; Climate research ; Polar research and research related to the High North; Research on sustainable development , economic growth, resource management and environmental impacts ;		

ToR 1 To summarise the main elements of the EU Maritime Strategy for the Atlantic Ocean Area and the subsequent Action Plan for the Maritime Strategy in the Atlantic Area, transatlantic cooperation agreements and initiatives (an example of the latter; the Galway Statement on Atlantic Ocean Cooperation), bilateral cooperation agreements, and any other relevant Atlantic research and cooperation agreements.		ToR 2 To summarise existing ICES work and other relevant work carried out by ICES Member Countries in the area of maritime transatlantic cooperation, by reference to the agreements and initiatives summarised under ToR 1.	ToR 3 To describe how the ICES cooperation structure could be used to facilitate and promote work under transatlantic cooperation agreements using the outputs from ToRs 1 and 2, including ICES position in relation to Horizon 2020 calls (e.g., BG-14-2014 “Supporting cooperation initiatives: Atlantic Ocean Cooperation Research Alliance”).	ToR 4 To identify new opportunities for trans-Atlantic marine science and research, that ICES could engage in to support the implementation of the ICES Strategic Plan, through the ICES network (expert groups, projects, databases, etc.), or by fostering strategic partnerships.
Programmes/Strategies/Agreements	Priorities/Topics	ICES work		
Arctic Council	Working groups: AMAP; CAFF; PAME			