

Joint PICES/ICES Study Group on Developing a Framework for Scientific Cooperation in Northern Hemisphere Science

Executive Summary

ICES and PICES are the major intergovernmental marine science organisations in the northern hemisphere, coordinating and steering activities of 23 countries, three of which are members of both organisations (Canada, USA and Russia). ICES and PICES have established a number of cooperative arrangements that include co-sponsored symposia, working groups, sessions in each others Annual Science Conferences and capacity building exercises. These are largely developed in response to the drive and synergy of scientists in the networks, and in the absence of a formal plan for cooperation. This document provides a framework for these cooperative activities to be developed, implemented, steered and managed, based on ICES and PICES needs and aspirations. The framework was developed by a study group on strategic planning, and will guide scientists and officers from both organisations in the development of this ongoing and expanding cooperation.

1 Background

ICES (International Council for the Exploration of the Sea) and PICES (North Pacific Marine Science Organization) are the major international intergovernmental marine science organizations in the northern hemisphere, with primary interests in the temperate and sub-Arctic regions of the Pacific and Atlantic Oceans, poleward of approximately 30°N. Both organizations have a responsibility to promote and to coordinate marine scientific research in their respective jurisdictions, and to promote the collection and exchange of information and data related to marine scientific research.

In recognition of shared interests and a desire by both organizations to facilitate and enhance cooperation between them, a Memorandum of Understanding (MOU) was signed in 1998 (Appendix 1) to provide a general framework for cooperation. The MOU specifies that the organizations should consult regularly on ways in which co-operation between them can be further improved and extended. The establishment of the P/ICES Study Group on *Strategic Planning* is consistent with principles of cooperation described in the MOU. The Study Group was established to develop a formal framework for cooperation between ICES and PICES to serve as the basis for linkages of our science plans and longer-term strategic planning. Its terms of reference are:

- 1) To review their organization's existing and planned scientific activities to identify scientific themes that could potentially benefit from the other's involvement in these activities.
- 2) To list potential areas of cooperation.
- 3) To convene a meeting/workshop to:
 - a) Improve understanding of the science activities of each organization;
 - b) Review scientific topics from TOR (1) to identify areas of common interest;
 - c) As an example of recent cooperation, review progress of the joint Working Group on *Forecasting of Climate Change Impacts on Fish and Shellfish* (WG-FCCIFS) established in 2008;
 - d) Develop a framework for cooperation between ICES and PICES that lists categories of joint activities and the rationale for each, including the benefits to each Organization from the joint activity; identify priorities for joint activities within categories;
 - e) Recommend processes for implementing TOR (3d);
 - f) Recommend approaches to develop a strategic plan for cooperation and mechanisms to periodically update that plan.
- 4) The Co-Chairmen will prepare a final Study Group report for distribution by the P/ICES Secretariats by August 2011.

Joint PICES/ICES SG-SP-2011

Membership from ICES includes: Manuel Barange (Chair SCICOM, co-Chair P/ICES SGSP), Adi Kellermann (ICES Secretariat), Begoña Santos and Mark Dickey-Collas (SCICOM representatives)

Membership from PICES includes: Sinjae Yoo (Chairman, Science Board), Skip McKinnell (PICCS Secretariat), Thomas Therriault and Hiroaki Saito (Science Board members).

The Study Group met first during the ICES ASC in Nantes, France, September 21, 2010 to plan their work. Most SG members were present as were some invited guests (from ICES: Jürgen Alheit, Germany; Bill Karp, USA and from PICCS: Anne Hollowed, USA; Suam Kim, Korea). The SG met again immediately prior to the PICCS Intersessional Science Board meeting in Honolulu, USA, April 29, 2011. This draft Study Group report was developed by correspondence for consideration by the ICES Scientific Committee and PICCS Science Board and, when approved, to the ICES and PICCS science communities for guidance.

Organisational structure and procedures

1.1 ICES

The International Council for the Exploration of the Sea (ICES) coordinates and promotes marine research on oceanography, the marine environment, the marine ecosystem, and on living marine resources in the North Atlantic. Members of the ICES community now include all coastal states bordering the North Atlantic and the Baltic Sea, with affiliate members in the Mediterranean Sea and southern hemisphere.

ICES is a network of more than 1600 scientists from 200 institutes linked by the ICES Convention to add value to national research efforts. Scientists working through ICES gather information about the marine ecosystem. Besides filling gaps in existing knowledge, this information is developed into unbiased, non-political advice. It is ICES vision to be an international scientific community that is relevant, responsive, sound, and credible concerning marine ecosystems and their relation to humanity. ICES mission is to advance scientific capacity to give advice on human activities affecting, and affected by, marine ecosystems.

ICES was established on 22 July 1902 in Copenhagen, Denmark, by eight founding nations, as the result of a concern growing during the late 19th century over the well-being of fish stocks in the North Sea coupled with efforts by different groups of scientists in neighbouring countries to promote and encourage international scientific marine cooperation.

ICES operates through a system of more than 120 Expert Groups. Groups under the Science Programme produce the science needed to underpin the advice and advance marine research into new fields to support new and future advisory needs. Science groups report to several overarching and cross-cutting Steering Groups which were set up by the ICES Science Committee (SCICOM) to coordinate and align the work of the Expert Groups with the ICES Science Plan. SCICOM is empowered to speak and decide on science issues on behalf of the organization. Groups under Advice produce scientific, independent advice on fisheries management, ecosystems and environmental issues which is peer reviewed and quality assured through a system of review groups. The final advice is released through the ICES Advisory Committee which is also empowered to speak and decide on behalf of the organization. The superior decision making body is the congregation of the national ICES delegates, the Council, which meets once per year in relation with the Annual Science Conference where the work programme for a given year is drafted and decided.

1.2 PICCS

The North Pacific Marine Science Organization (PICCS) is the international, intergovernmental organization that is responsible for coordinating and promoting marine scientific research and scientific information exchange among its members (Canada, Japan, People's Republic of China, Republic of Korea, Russian Federation, and the United States of America). The primary area of interest to the organization is the northern

North Pacific Ocean, bounded at the south by 30°N latitude and in the north by Bering Strait. PICES was established by international convention in 1992, with a Secretariat hosted by Fisheries and Oceans Canada at the Institute of Ocean Sciences, Patricia Bay, Canada.

Two Delegates from each member country plus a Chairman elected by the Delegates form a Governing Council that is responsible for policy, general direction, and priority setting. The scientific activities of PICES are established by a network of 300 scientists, appointed by the members to serve on Standing Committees and various thematic expert groups. Governing Council is advised by its Science Board on scientific priorities for the Organization. The Science Board is formed by the chairs of the six permanent Scientific and Technical Committees and the leaders of major scientific initiatives of the Organization. Should any member country not be represented on Science Board by virtue of having a chairmanship, it can appoint a representative to serve its scientific interests.

The scientific work of PICES is conducted primarily by ephemeral Working Groups and Study Groups with 1-3 year lifespans to achieve the results described in their terms of reference. Advisory Panels and Sections provide longer-lived expert groups to maintain specific expertise within PICES. Chairmanship for expert groups is often shared by Asian and North American scientists. The Scientific and Technical Committees are responsible for the planning and direction of major disciplinary themes within the Organization. They provide general supervision to the expert groups and report their activities to Science Board.

From time to time, Science Board has provided formal scientific advice to a member country but it is not a major activity. Scientists in PICES have focused on reporting status and trends in the North Pacific and understanding the nature and consequences of global climate change. New initiatives will seek to communicate this understanding to society.

The work of the Organization is determined primarily by the scientists of the member countries. They are supported by a Secretariat that is responsible for organizing their international meetings and workshops, publishing their work, fundraising, maintaining and developing the PICES website, maintaining and enhancing relations with other international organizations, and for the day to day running of the Organization. When called upon, Secretariat leads the development of major scientific products.

2 Major scientific topics of joint interest to ICES and PICES

ICES and PICES provide governments with international fora for joint scientific research and the provision of scientific advice on marine ecosystems. The strategy should allow ICES and PICES scientists to add value to their science, provide synergies on regional and global issues, and enhance the visibility of both organisations. This Strategy should be adaptive to allow the organisations to respond to changing priorities of the science world.

The group identified 4 long-term research priority areas for the P/ICES Cooperation Strategy given the new ICES Science Program and the PICES FUTURE Program:

- a) **Climate change.** There are considerable uncertainties regarding the impact of climate change on marine ecosystems. Consideration is needed of the degree to which predicted changes in the physical and chemical environment will impact ecosystem properties. Priority ecosystem properties include productivity, habitat quality and quantity and therefore marine biodiversity, species phenology, distribution, species interactions and the sustainability of fisheries and aquaculture. Changes in the interactive nature of ocean and atmosphere dynamics also need significant consideration. The above require greater effort in improving current forecast and hindcast models, and the development of scenarios of change. Both PICES and ICES have worked independently in the past on these issues and synergy would improve the likelihood of success, and a unified northern hemisphere voice.
- b) **Ecosystem assessment (including ecosystem modelling).** The European Marine Strategy Framework Directive requires the development of indicators of ecosystem state and function for the European seas, to ensure these achieve good environmental status (GES). ICES and its member countries are developing the

scientific base for the MSFD, which relies on ecosystem assessments. PICES is developing a framework of indicators for the North Pacific, leading to a similar vision of assessing the state of ecosystems. One of the scientific challenges of these developments is the quantification of ecosystem resilience, or its ability to recover from disturbance, and the development of end-to-end modelling capability. As anthropogenic impacts such as climate change, pollution, overfishing, *etc.* impact the world's seas, resilience becomes an important attribute which will determine the resistance to irreversible changes. In the past ICES has focused primarily on the linear process of resilience erosion, while PICES has devoted significant attention to non-linear processes or regime shifts. By comparing and contrasting impacts and mitigation measures from across P/ICES areas, both organisations can progress our understanding of linear and non-linear vulnerability changes to management actions, with a view of developing ecosystem assessment principles and methodologies. Key to these methodologies is the development of ecosystem end-to-end models of diverse complexity, geographical focus and structure, to be used both as scientific tools as well as assessment tools.

- c) **Ocean acidification and hypoxia/anoxia.** Although significantly different, these phenomena require the engagement of the physical, chemical and biological oceanographic community of both organisations to tackle these issues that have been considered the "other side" of climate change. The decrease in pH in the world's oceans as a result of increased anthropogenic CO₂ dissolved in seawater has received less attention than other anthropogenic impacts but also has the potential to cause irreversible damage to many marine organisms with calcium carbonate structures. Integration of this knowledge into broader resource management frameworks appears essential. An even less appreciated but equally significant phenomenon is the observed decrease in subsurface oxygen concentrations over the shelf and coastal regions in many areas of the world, and the extension of low-oxygen "dead zones". Combined with the observed increases in the number of hypoxia episodes (low concentrations of oxygen that result in the injury and/or death of marine organisms) in coastal environments, deoxygenation appears to be a significant process requiring basin- and hemisphere-wide attention.
- d) **Marine spatial planning.** Human pressure on coastal and oceanic ecosystems is increasing continuously through the combined impacts of pollution, overfishing, coastal developments, shipping, *etc.* Achieving sustainable use of marine resources will require the management of all these pressures. Recent policy drivers in the ICES area (European Commission review of the Common Fisheries Policy, Marine Strategy Framework Directive) require a quantum leap in the way we understand and implement spatial planning. Sharing knowledge on tools, best practices, implementation, *etc.* between both organizations is considered important.

While this list is not exhaustive, and should not limit cooperation in other areas where developments in both organisations meet (*e.g.*, bioinvasions), it provides a good focus to steer and prioritise cooperation. In addition there are operational areas in which P/ICES cooperation would be beneficial. These include training, international exposure, and data management.

- a) **Training.** ICES and PICES should promote cooperation in the training of personnel and exchange of experts. Comprehensive training is the base for future research. ICES already has a Training Programme in place which is particularly targeted at supporting science advisory needs, but includes other fields as well. This programme could provide a platform for joint training activities. Provision of training opportunities for early career scientists continues to be a priority for both ICES and PICES. Currently, the two organizations co-sponsor an annual summer school to provide technical training to scientists from less developed countries or who require special expertise. However, there are other areas in which technical or scientific training could be provided, including the potential for on-line training opportunities, and exchange of expertise should be encouraged.
- b) **Knowledge exchange/Communication.** Both organisations have avenues of communication and knowledge exchange. In the case of ICES this includes: the ICES Journal of Marine Science which is a peer review journal, the ICES Cooperative Research Reports, ICES Insight and several other miscellaneous publications, steered by a Publications and Communications Committee (PUBCOM). PICES also produces a number of scientific reports, special issues in peer review journals, PICES Press, *etc.* The Advisory Panel on *Status, Outlooks, Forecasts, and Engagement* (SOFE-AP) of the PICES

FUTURE programme is responsible for communicating FUTURE Science to a variety of audiences. There are many reasons to maintain a publication programme, including institutional exposure and the development of a public image. However, it may be advantageous for both organisations to explore in the future whether there are opportunities for shared publications when the opportunity arises (*e.g.*, joint symposia), and where exposure of ICES and PICES work would have more impact on the world stage if carried out together.

3 Implementation procedures

There are many potential mechanisms for cooperation between ICES and PICES. Such mechanisms include:

- Theme Sessions at annual meetings
- Working Groups
- Symposia
- Workshops
- Strategic Initiatives

Theme Sessions

Joint Theme Sessions have been the most common mechanism for cooperation between ICES and PICES. There are a large number of past examples of co-hosted sessions at both the Annual ICES Annual Science Conference and the PICES Annual Meeting, where the benefits of sharing research findings and expertise have been demonstrated.

To improve planning and coordination within each organization, ICES and PICES have established deadlines prior to their respective science executive meetings in the fall to allow time for a thorough review and discussion of the proposed sessions within each organization. A common deadline for each organization (September 6, 2011), set in advance of the ICES ASC, also provided an opportunity to share information on the total collection of proposed sessions, whether jointly sponsored or not. Sharing session information may lead to joint sponsorship where it was not anticipated by the proponents.

- PICES – Topic session proposals generated by scientists working under the PICES umbrella should be sent to the PICES Secretariat by the deadline. Proposals should include: a title, duration (generally full or half day), session description, list of convenors, sponsoring PICES committee(s), co-sponsoring organizations (if any), and whether (and where) a publication is intended.
- ICES – Theme session proposals may come from any scientist in the ICES science community and should be submitted to the ICES Secretariat by the deadline. It is helpful to inform the Chair of an ICES Expert Group or SCICOM Steering Group relevant to the proposal to seek its support. The proposal needs to include a concise but sharp description of the session, names of the conveners with affiliation, and its relevance to the ICES Science Plan.

The ICES SCICOM and PICES SB will evaluate and agree on cosponsoring of sessions. The agreement will consider not just the scientific excellence and appropriateness of the proposals, but also the financial constraints of funding such sessions.

Working Groups

- PICES – Working Groups in PICES are overseen by its Scientific Committees. In general, few are formed each year so effective planning is a crucial element of successfully establishing a WG. The need to establish a WG usually follows after one or a series of topic sessions and workshops that are organized on a common theme over a period of 1 year or more. Thereafter, a request for a Study Group (SG are generally 1 year in duration) can be a first step in establishing the Terms of Reference and

potential membership of a Working Group, with a typical duration of 3 years. FUTURE Advisory Panels will review these proposals to determine their relevance and importance to the FUTURE Science Program. As a consequence of the relatively lengthy process, there is no set schedule for submitting proposals, except to note that SG/WG proposals can be brought to the attention of SB by a Committee chairman either at the inter-sessional meeting in the spring or at the annual meeting in the fall. As decisions are taken by consensus, scientists from all Member States should be consulted.

- ICES – ICES work is accomplished by various committees, expert groups, and workshops. Currently, there is an Advisory Committee (ACOM) that provides advice to clients on fisheries and marine ecosystem issues, and a Science Committee (SCICOM) formally the Consultative Committee as established in the ICES Convention) that oversees all aspects of the scientific work. These two committees establish groups that deal with specific science and advisory topics as required. Working under ACOM are Expert Groups, Review Groups, Advice Drafting Groups, and Data/Benchmark workshops. Proposals for Working Groups are presented through one of the five Steering Groups of the ICES Science Committee. The Science Committee makes final decisions on the creation, dissolution and extension of working groups. ICES does not provide funding to activate its working groups, and therefore decisions are based exclusively on the scientific excellence, advisory need, and bottom-up drive of the proposal. From 2011 ICES working groups are given terms of reference for a 3-year period, at which point they can request extension, modification or closure, based on a self-assessment procedure.

There has been one previous example of a joint P/ICES WG. They represent one of the most effective mechanisms for cooperation when there is the need to focus on a specific topic with specific deliverables defined by terms of reference. Given the different mechanisms of implementation of working groups in ICES and PICES proposers are asked to engage at an early stage with the Secretariats of both bodies to explore ways of implementing proposals.

Symposia

ICES and PICES have co-sponsored many symposia. This is a fairly well tested cooperative approach which operates successfully (see Appendix 2). Symposia chosen must offer research and science fields of interest to both ICES and PICES. Both organisations must have scientists from their areas on the organising or science committees. Co-sponsoring sessions at international conferences can raise the profile of research being conducted by ICES and PICES.

- PICES – Proposals generated internally within PICES for jointly sponsored symposia are generally brought to the attention of Science Board by Committee chairmen at one of its two meetings during the year. The nature of the discussion often depends on whether PICES is asked to be the organizer. Normally, PICES organizes one major symposium per year in the spring. Typically, this symposium is jointly sponsored because of the financial commitments required to organize a major symposium. Organizations seeking co-sponsorship of a symposium by PICES should direct a letter of invitation to the Executive Secretary of PICES. In addition to the scientific imperative, the letter should include the names of other co-sponsoring organizations and a summary of role and financial/in-kind contributions expected of PICES. The Executive Secretary will circulate the invitation to the relevant Committees. Significant commitments of resources typically require 2–3 years advance planning.
- ICES – symposia to be co-sponsored by ICES require a special resolution category to be filled in by the conveners or organizers of the symposium and discussed at one of the two annual meetings of the Science Committee. Symposium sponsorship by ICES could consist of endorsement by ICES of the objectives and scientific excellence of the planned symposium, financial assistance, and an opportunity to use to *ICES Journal of Marine Science* as an outlet for the proceedings.

SCICOM decides on the pathways, criteria and nature of sponsorship to maintain the quality of the ICES label for sponsoring science symposia. Criteria for consideration include scientific quality, solid basis for

co-sponsorship, strategic links to ICES science and advisory priorities, sufficient time and space left before the event to accommodate planning, sound financial basis.

Requests are submitted to SCICOM for approval via the Head of Science Programme, at least 1 year in advance of the symposium in question. The SCICOM Steering Group Chair relevant to the topic should be informed as he will assist the Head of Science Programme in shadowing the symposium. The level of financial support is limited and predetermined.

Workshops

New emerging issues often demand innovative and multidisciplinary approaches. The ability to deal with and resolve new concepts is likely to be enhanced by the bringing together of ICES and PICES expertise. The recent PICES FUTURE workshop on ecosystem indicators (April 2011) is such an example, where the search for representative, easy to measure and cost-effective indicators of ecosystem status in the Pacific could be helped by the European experience on ecosystem indicators developed as part of the Marine Strategy Framework Directive.

- PICES – Proposals for jointly sponsored workshops are generally brought to the attention of Science Board by Committee chairmen. For the most part, a proposal for a workshop should resemble a proposal for a scientific session, with some additional information depending on whether it is associated with a P/ICES annual meeting local host/organizer, institute/location, dates, financial expectations of PICES (commonly for invited speakers from PICES and/or PICES convenors).
- ICES – The procedure for consideration and approval of workshops in ICES is identical to that for working groups. As for working groups ICES does not provide financial support to workshops, unless a special category 4 resolution is tabled at the annual meeting of the ICES council.

Strategic Initiatives (ICES nomenclature)/Scientific Programmes (PICES)

Strategic initiatives (SI) are new cross-cutting activities that require the engagement and participation of several organisations. They are aimed at multi-disciplinary topics that could benefit from additional coordination. In ICES such initiatives have been implemented for four areas of cooperation: Biodiversity, Climate change, Marine spatial planning and Stock Assessment methods. The SI on climate change (see below) is expected to be co-sponsored by PICES.

SI are equivalent to Scientific programmes in the PICES system, although their use has been limited.

Cooperation in the area of SI/SP on climate change is being developed and tested by the Joint ICES-PICES Strategic Initiative on Climate Change effects on Marine Ecosystems (SICCME) which aims to ensure that “*ICES and PICES will become the leading international organizations providing science and advice related to the effects of climate change and variability on marine resources and ecosystems*”. This joint activity builds on the work of the Joint Working Group on Forecasting Climate Change Impacts on Fish and Shellfish (WG-FCCIFS) and on previous activities that were developed within each organization.

Other

ICES and PICES could explore joint participation as partners in international/EU projects, providing expertise, gaining knowledge and helping to deliver sustainable management of marine systems. Collectively, ICES and PICES could also provide advice in a united manner to international bodies or committees (e.g., IPPC or RFMO).

4 Monitoring/steering cooperation

The group concludes that this framework should provide sufficient guidance to the ICES and PICES communities to develop bottom-up joint activities (section 3), with clear procedures for approval and implementation (section 4). The implementation of these activities needs to be agreed by the organisations' respective science bodies: the Science Board (SB) in the case of PICES and the Science Committee (SCICOM) in the case of ICES. In the consideration of cooperative proposals these bodies also need to consider their own scientific priorities as determined by their science, implementation, and/or strategic plans,

- the financial and structural constraints under which the organizations operate and,
- the balance of cooperative activities in their own portfolios.

Section 4 also provides guidance as to when and how proposals need to be developed and tabled at the above committees.

However, a mechanism is needed to monitor and steer P/ICES collaborative arrangements, and to act as an interface between the PICES SB/ICES SCICOM and the proponents of joint collaborative activities. It is proposed that this role be carried out, in the case of ICES by the Chair of SCICOM and the ICES Secretariat Head of Science Programme, and in the case of PICES by the Chair of the Science Board and a representative from the PICES Secretariat. This group ensures a responsive structure with a light footprint and minimal additional costs, and with the mandate to implement common activities in line with this report. Nevertheless, it is suggested that a wider strategic analysis be conducted every 3–5 years, and that this includes an additional 2–5 members of each organization. There is no need to formalize this group at this stage as it should reflect the cooperation that develops in the coming years.

5 Conclusion and next steps

The P/ICES Study Group on Science Cooperation agreed on the need for a formal framework to guide, develop, implement and monitor arrangements between PICES and ICES in the area of science cooperation.

It was recognized that collaborations had developed very successfully in recent years, mostly through interactions between individual scientists or between the Secretariats. While this process is welcome and supported it can also bypass the scientific structures of the organizations. As cooperation evolves it is important to establish priorities for cooperation, mechanisms for approval and implementation, and processes for monitoring and steering.

The Study Group report provides a vision and a set of priorities to guide the communities in the development of scientific cooperation arrangements. In particular, cooperation is encouraged in the following areas:

- Climate change
- Ecosystem assessment/ modelling
- Ocean acidification / hypoxia
- Marine spatial planning

It is also recognized that cooperation should continue or be developed in a number of operational areas such as data management, training and science communication.

The report describes the collaborative procedures to be followed, for joint working groups, joint workshops and symposia, theme sessions at ICES and PICES annual meetings and joint strategic initiatives/sections. Procedures for other collaborations (*e.g.*, Publications, Training) may require further development.

The proposals in this report ensure that the relevant science structures of PICES and ICES take ownership of the process of approval and implementation of cooperative arrangements. Finally, the group suggests that the monitoring and steering be conducted by the chairs of ICES SCICOM and PICES SB, and the Head of Science

(or equivalent) in the ICES and PICES Secretariat. A broader meeting every 3–5 years would provide room for a review of the collaboration, and the development of a strategic pathway that maximizes the value to both organizations.

This report and its recommendations are to be tabled at the autumn 2011 meetings of the ICES SCICOM and PICES SB. It is recommended that these recommendations, if approved, be implemented immediately, and that the group of four in charge of monitoring and steering cooperation provide a brief update of the implementation of this framework annually.

Annex 1: Memorandum of Understanding between the North Pacific Marine Science Organization and the International Council for the Exploration of the Sea

Recognizing that the North Pacific Marine Science Organization, (PICES), hereinafter called “the Organization”, exists to (a) promote and coordinate marine scientific research in order to advance scientific knowledge of the area concerned and of its living resources, including but not necessarily limited to research with respect to the ocean environment and its interactions with land and atmosphere, its role in and response to global weather and climate change, its flora, fauna, and ecosystems, its uses and resources, and impacts upon it from human activities; and (b) promote the collection and exchange of information and data related to marine scientific research in the area concerned. In order to further enhance its institutional capabilities, the Organization seeks, *inter alia*, to establish and maintain mutually agreed working arrangements with other international organizations which have related objectives.

Recognizing that the International Council for the Exploration of the Sea, hereinafter called “the Council”, exists to: (a) promote and encourage research and investigations for the study of the sea particularly related to the living resources thereof; (b) draw up programmes required for this purpose and to organize, in agreement with its Contracting Parties, such research and investigations as may appear necessary; (c) publish or otherwise disseminate the results of this work; and (d) provide scientific information and advice to Member Country governments, and the regulatory commissions with which co-operative relationships have been established. In order to carry out these tasks appropriately and efficiently, the Council seeks, *inter alia*, to establish and maintain mutually agreed working arrangements with other international organisations which have related objectives.

The Organization and the Council, hereinafter called “the Parties”, have, therefore, agreed to the following Understanding:

- 1) There shall be reciprocal consultations and regular contacts between the Parties on matters of common interest in the field of marine scientific research, data exchange, and training and related activities, including environmental studies;
- 2) There shall be regular exchange between the Parties of information, documents, and publications relating to programme and project plans and to the results of activities agreed to be of mutual interest, joint or otherwise;
- 3) The Parties shall invite each other to be represented, in an observer capacity, at meetings of common interest, to the extent that this is possible within their respective working procedures;
- 4) The Parties shall, as appropriate, undertake joint activities, including when required, the establishment of joint subsidiary bodies or other suitable arrangements, to study and report on matters of common interest, including the support of those activities that concern them both;
- 5) The Parties shall consult regularly on ways in which co-operation between them can be further improved and extended. Specific joint programmes and activities may be defined through addenda to this framework agreement on a biennial basis;
- 6) The terms of this Understanding may be revised by the Parties if they both agree. The Understanding shall continue on the basis of the existing terms until new terms have been agreed;
- 7) Either Party may withdraw from the Understanding at any time subject to giving one year's written notice to the other Party;
Any agreement, arrangement or joint activity entered into in consequence of this Memorandum of Understanding which involves a financial commitment will be covered by an annex to this Memorandum governing the provision of funds;
- 8) Recognizing and fully respecting their various mandates, policies and priorities, the Parties agree that this Understanding shall enter into force upon signature and shall remain in force unless either Party withdraws pursuant to Paragraph 7 above.

Appendix 2: Table of past and future (agreed) cooperation

Table 1 List of PICES / ICES co-sponsored symposia for 2010–2012.

Year	Date	Title	Venue	Conveners	Co-Sponsors
2010	November 8–11	Symposium on “ <i>Ecosystems 2010: Global progress on ecosystem-based fisheries management</i> ”	Anchorage, USA	G. Kruse (USA), P. Livingston (USA), D. Woodby (USA), D. Evans (USA), C. Zhang (Korea), G. Jamieson (Canada)	Alaska Sea Grant, FAO, US NMFS, NPFMC, Alaska Depart. of Fish and Game
2011	March 14–18	5th International Zooplankton Production Symposium	Pucón, Chile	R. Escribano (Chile), D. Bonnet (France), J. Keister (USA)	DFO
2011	April 26–28	Workshop on “ <i>Indicators of status and change within North Pacific marine ecosystems</i> ”	Honolulu, USA	Thomas Therriault (Canada), Sachihiko Itoh (Japan), Jacquelynne King (Canada), ICES participation	FUTURE
2011	May 2–6	Workshop on “ <i>Reaction of northern hemisphere ecosystems to climate events (regime shifts): A comparison</i> ”, May 2–6, 2011, Hamburg, Germany;	Hamburg, Germany	Jürgen Alheit (ICES/Germany), Christian Möllmann (ICES/Germany), Sukgeun Jung (PICES/Korea), Yoshiro Watanabe (PICES/Japan)	ICES, PICES
2011	May 22–26	Symposium on “ <i>Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observations and prediction</i> ”	Seattle, USA	G. Hunt (USA), Ó. Astthórsson (Iceland), M. Kishi (Japan)	ESSAS
2011	May 22	Workshop on “ <i>Biological consequences of a decrease in sea ice in Arctic and Sub-Arctic Seas</i> ”	Seattle, USA	Anne Hollowed (PICES), Harald Loeng (ICES)	ICES, PICES
2011	September 21–24	Theme sessions at ASC on: “ <i>Atmospheric forcing of Northern hemisphere ocean gyres and their subsequent impact on the adjacent marine climate and ecosystems</i> ”; “ <i>Atlantic redfish and Pacific rockfish: comparing biology, ecology, assessment and management strategies for <i>Sebastes spp.</i></i> ”; “ <i>Recruitment processes: Early life history dynamics – from eggs to juveniles</i> ”; “ <i>Surplus production models: Quantitative tools to manage exploited fisheries and compare the productivity of marine ecosystems</i> ”	Gdansk, Poland	Jürgen Alheit (ICES/Germany), Hjálmar Hátún (ICES/Faroe Islands), Emanuele Di Lorenzo (PICES/USA), Ichiro Yasuda (PICES/Japan) Benjamin Planque (ICES/Norway), Paul Spencer (PICES/USA), Christoph Stransky (ICES/Germany), Steve Cadlin (ICES/USA) Richard Nash (ICES/Norway), Ed Houde (ICES/USA), Rick Brodeur (PICES/USA) Ken Drinkwater (ICES/Norway), Jason Link (ICES/USA), Jennifer Boldt (PICES/Canada), Ian Perry (PICES/Canada)	ICES, PICES

Year	Date	Title	Venue	Conveners	Co-Sponsors
2011	October	Topic session at PICES-2011 on “ <i>Linking migratory fish behavior to end-to-end models</i> ”	Khabarovsk, Russia	Michio Kishi, Shin-ichi Ito, Enrique Curchitser, and Skip McKinnell (PICES), Geir Huse (ICES)	PICES, ICES
		Session on “ <i>Mechanisms of physical-biological coupling forcing biological “hotspots”</i> ”		Elliott Hazen (PICES/ U.S.A.), Oleg Katugin (PICES/Russia), Robert Suryan (PICES/U.S.A.), Yutaka Watanuki (PICES/Japan), Ichiro Yasuda (PICES/Japan), Jürgen Alheit (ICES/Germany)	
		Workshop on “ <i>Trends in marine contaminants and their effects in a changing ocean: Refining indicator approaches in support of coastal management</i> ”		Olga Lukyanova (Russia, PICES), Peter Ross (PICES/Canada), Kris Cooremans (ICES/B)	
2012	April	Early Career Scientist Conference “ <i>Oceans of change</i> ”	Mallorca, Spain	A. Kellermann (ICES/Denmark), S. McKinnell (PICES/Canada)	NOAA, Regional Government of Majorca
2012	May 14–18	Second Symposium on “ <i>Effects of climate changes on the world’s oceans</i> ”	Yeosu, Korea	L. Valdes (Spain), K. Suam (Korea), S. Hughes (UK), Hiroaki Saito (Japan)	IOC, MIFFAF (Korea)
2012	November 8–12 (tentative)	Forage Fish Interactions and Ecosystem Approach to Fisheries Management (FACTS)	Nantes, France	S. Neuenfeldt (Denmark), M. Peck (Germany), plus two externals	FACTS (ECFP7)

NMFS: National Marine Fisheries Service

NPFMC: North Pacific Fishery Management Council

DFO: Fisheries and Oceans Canada

ESSAS: Ecosystem Studies of Sub-Arctic Seas Program

IOC: Intergovernmental Oceanographic Commission