

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
(PICES)**

ANNUAL REPORT

TWENTY FIRST MEETING
HIROSHIMA, JAPAN
OCTOBER 12–21, 2012

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Report of Opening Session

AGENDA ITEM 1

Opening by the Chairman of PICES

The Opening Session started at 09:00 hours on October 15, 2012. Dr. Lev Bocharov, Chairman of PICES, welcomed delegates, observers and researchers to Hiroshima and formally declared that the PICES Twenty-First Annual Meeting (PICES-2012) was open. The session agenda is appended as *OP Endnote 1*.

AGENDA ITEM 2

Welcome addresses on behalf of the host country

Mr. Kenji Kagawa (Director-General, Resources Enhancement Promotion Department, Fisheries Agency of Japan) and Dr. Toshihiko Matsusato (President, Fisheries Research Agency of Japan) welcomed participants on behalf of the host country (*OP Endnotes 2 and 3*).

AGENDA ITEM 3

Remarks by the Chairman of PICES

Dr. Bocharov thanked Mr. Kagawa and Dr. Matsusato for their remarks, and addressed the participants on behalf of PICES (*OP Endnote 4*).

AGENDA ITEM 4

Wooster Award presentation ceremony

Dr. Bocharov and Dr. Sinjae Yoo, Chairman of Science Board, conducted the Wooster Award presentation ceremony. Dr. Yoo introduced the award and announced that the 2012 award was being given to Dr. Richard Beamish (Emeritus Scientist, Pacific Biological Station, Fisheries and Oceans Canada) for his outstanding contribution to Canadian and international research, with innovative approaches to ecosystem science, species age determination, taxonomy, and climate change impacts on marine resources (*OP Endnote 5*). Reading of the Science Board citation was accompanied by a slide show dedicated to Dr. Beamish. A commemorative plaque was presented to Dr. Beamish (a permanent plaque identifying all Wooster Award recipients resides at the PICES Secretariat), who accepted the award with the following remarks of thanks:

I very much appreciate receiving the Wooster Award from PICES because it is recognition from my colleagues and it is named after a person that I worked closely with for many years. I think that Warren Wooster first talked to me in the late 1970s about the need to relate fish population dynamics to climate and ocean conditions. This was a time when many in fisheries science considered that climate and the ocean effects on fish would be mostly random. For example, it was believed that fishing and freshwater habitat were the most important factors regulating the abundance of Pacific salmon. Warren had a friendly and unrelenting way of recruiting people into his way of thinking. This was not a problem for me as I found it refreshing that there was someone else who believed that trends in climate and the ocean strongly affected fish abundance. Together we ran an organization called IRIS, which was a "Woosterism" for "International Recruitment Studies in the Subarctic." IRIS was formed to demonstrate to Canada and the United States that a PICES-type of organization was an efficient way of improving the understanding of the mechanisms that regulated fish abundance. Warren Wooster was not as enthusiastic about fish as I was, but this never got in the way of our vision of PICES. Once PICES was formed, we continued to work together as he assigned me and colleagues to the various groups and tasks.

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If Warren Wooster was still with us, I would try to talk him into supporting an “International Year of the Salmon.” A few days ago, I was at the North Pacific Anadromous Fish Commission meeting in St. Petersburg, Russia, and presented a paper on the value of forming an integrated group of researchers to determine how Pacific salmon populations are regulated, and to develop models that will use climate and ocean parameters to forecast production trends of the various species of salmon. I think we are close to being able to do this if we can get the support to build teams of researchers. I suggested that participants in PICES would be essential to the success of the effort. I have the feeling that Warren Wooster would even be pleased with this idea.

I always tell people that there is very little that I do all by myself. There is a list of collaborators and people that influence what I do that is much too long to report. So let me simply say, “Colleagues, thank you for your help and thank you for all the years of fascinating science that I have enjoyed at PICES.”

AGENDA ITEM 5

PICES Ocean Monitoring Service Award presentation ceremony

Drs. Bocharov and Yoo also conducted the presentation ceremony of the PICES Ocean Monitoring Service Award (POMA). Dr. Yoo introduced the award and announced that the 2012 award was being given to the California Cooperative Fisheries Investigations (CalCOFI, *OP Endnote 6*). Reading of the Science Board citation was accompanied by a slide show dedicated to CalCOFI. A commemorative plaque (a permanent plaque identifying all POMA recipients resides at the PICES Secretariat) and a certificate were presented to Drs. Anthony Koslow (Scripps Institution of Oceanography, UCSD, U.S.A.) and Steven Bograd (Southwest Fisheries Science Center, NMFS, U.S.A.). Dr. Koslow provided the following remarks of appreciation:

I am both proud and humble to accept the PICES Ocean Monitoring Service Award on behalf of Scripps Institution of Oceanography and NOAA. CalCOFI is a unique partnership of government and academic institutions: NOAA, the California Department of Fish and Game, and Scripps Institution of Oceanography. As such, its mission since its inception in 1949 has been to study and manage the living marine resources of the California Current within an ecosystem context. Key achievements of an earlier generation of CalCOFI scientists included development of the daily egg production to assess the northern anchovy and Pacific sardine fisheries, descriptions of the pelagic communities of the California Current, and the first understanding of the impact of ENSO on that ecosystem. The program continued to evolve through the years, adopting new instruments, and making new measurements as that became possible, while building on the old. Today, it is one of the few truly end-to-end observation programs in the world, carrying out observations from winds to whales on its quarterly cruises. In recent years, CalCOFI data have been instrumental in defining the impacts of decadal-scale Pacific variability and exploring the possible influence of climate change, developing new fishery-independent time series for key species, such as market squid and spiny lobster, and describing and modeling changes in deep-water oxygen concentrations and their impacts on mid-water fish communities.

CalCOFI is now more than 60 years old and is the fruit of several generations of scientists at Scripps Institution of Oceanography and NOAA. We are both humble and grateful to receive the award on behalf of all those, past and present, who built this program. If we see further than those who went before us, it is because (as Isaac Newton once said) we stand on the shoulders of giants.

AGENDA ITEM 6

PICES “Year-in-Review” 2012

Dr. Yoo reviewed PICES’ scientific accomplishments since the Twentieth Annual Meeting (PICES-2011) in Khabarovsk, Russia. An article on the state of PICES science for 2012 will be published in the 2013 winter issue of PICES Press (Vol. 21, No. 1).

The 2012 keynote lecture entitled “*Resilience and sustainability of the human-ocean coupled system – Beyond the Great East Japan Earthquake*” was given by Dr. Tokio Wada (Executive Director, Fisheries Research Agency of Japan) as part of the Science Board Symposium on “*Effects of natural and anthropogenic stressors in the North Pacific ecosystems: Scientific challenges and possible solutions*”. The abstract of this talk is appended to the report as *OP Endnote 7*.

AGENDA ITEM 7

Closing remarks and announcements

The session was adjourned at 10:00 a.m., after announcements related to the logistics of the Annual Meeting made by Dr. Stewart (Skip) McKinnell, Deputy Executive Secretary of PICES.

OP Endnote 1

Opening Session agenda

1. Opening by the Chairman of PICES, Dr. Lev Bocharov
2. Welcome address on behalf of the host country:
 - Mr. Kenji Kagawa, Director-General, Resources Enhancement Promotion Department, Fisheries Agency of Japan
 - Dr. Toshihiko Matsusato, President, Fisheries Research Agency of Japan
3. Remarks by the Chairman of PICES, Dr. Lev Bocharov
4. 2012 PICES Wooster Award presentation ceremony
5. 2012 PICES Ocean Monitoring Service Award presentation ceremony
6. *PICES "Year-in-Review" 2012* by the Chairman of Science Board, Dr. Sinjae Yoo
7. Closing remarks/announcements

OP Endnote 2

Welcome address by Mr. Kenji Kagawa (Director-General, Resources Enhancement Promotion Department, Fisheries Agency of Japan)

Mr. Chairman, delegates of member nations, and researchers who are participating in this meeting:

On behalf of the Japanese government, it is my great pleasure to welcome you all to this 2012 Annual Meeting of PICES, held here in Hiroshima. First, I would like to express my deepest gratitude to the PICES Secretariat for their great efforts to organize the Annual Meeting and the scientists for providing a wonderful environment for this event. I would also like to thank the City of Hiroshima for providing generous support to this meeting hosted by Japan. Thanks to the kind support of the city and the people of Hiroshima, we are able to hold the meeting at this excellent venue.

Since its foundation, PICES has been greatly contributing to the promotion of marine research in the North Pacific. Recently PICES has been actively addressing the common issues of marine ecosystems, shared by member nations, including harmful red tides and the expansion of biological invaders, and has produced many important results. I would like to express my deepest respect to Chairman Dr. Bocharov, Executive Secretary Dr. Bychkov, and many others who have made extra efforts in these endeavors.

Marine biological resources and the services offered by marine ecosystems are common assets that nature has given to humans. It is our duty and responsibility to preserve them appropriately and to use them in a sustainable manner. I believe that the development of marine science promoted by PICES and the collaborations of its member nations greatly support us in carrying out our responsibility. I sincerely hope that PICES will continue to play a leading role in promoting marine scientific research in the North Pacific, and that the outcomes will be widely used in different areas of the North Pacific.

In closing, I would like to extend my best wishes for the success of this Annual Meeting, hoping that it will produce many scientific outcomes and that it will help deepen mutual friendship and trust among the participants. Thank you.

OP Endnote 3

Welcome address by Dr. Toshihiko Matsusato, President, Fisheries Research Agency of Japan

Mr. Chairman, delegates of member nations, distinguished guests, ladies and gentlemen:

I would like to extend my heartfelt welcome to all of you on behalf of the Fisheries Research Agency of Japan, which is cooperating in organizing the 2012 Annual Meeting of PICES.

PICES has been engaged in various scientific activities since it was founded in 1992 to promote the development of marine science in the North Pacific and the international cooperation in this region for this purpose. During these years, the exchanges among scientists and research organizations of member nations have greatly expanded to advance our work in various fields of marine science, and I am pleased to see that the collaborations and ties among scientists and research organizations have been strengthened.

While the effects of global warming have become tangible, we recognize more than ever that maintaining biodiversity is imperative for human welfare. Facing this situation, the activities of PICES, addressing the theme of elucidating the natural and anthropogenic disturbances in the North Pacific and how marine ecosystems are affected, will become more important not only for its member nations but also for the entire Pacific Rim Region. In this regard, research institutes and universities of member nations must further promote mutual collaborations to clarify the issues and to produce outcomes that will contribute widely to the global society.

The Fisheries Research Agency of Japan is the only comprehensive marine research institute in Japan, conducting a wide range of research and development activities on fisheries, from basic research to applications. It has been actively supporting the activities of PICES, and it is our great pleasure that we have been able to contribute to clarifying the changes of marine ecosystems in the North Pacific and the population dynamics of marine resources, and that the research outcomes have been used to address various issues, including harmful red tides and jellyfish.

The Fisheries Research Agency has established the National Research Institute of Fisheries and Environment of Inland Sea here in Hiroshima to carry out research on ecosystems in the coastal areas, and on how to increase fishery production as well as research on marine environment. We firmly believe that in addition to research on outer sea, the work on coastal zone will also contribute to the advancement of the activities of PICES.

It is a great honor for us to help organize the Annual Meeting of PICES held in Hiroshima. I would like to take this opportunity to offer my deepest appreciation once again to PICES, its member nations and our colleagues for your warm and generous support provided to those affected by the Great East Japan Earthquake, which occurred on March 11, 2011.

In closing, I offer my best wishes for the success of this Annual Meeting, and my sincere hope that you all will enjoy your stay in Hiroshima. Thank you.

OP Endnote 4

Welcome address by Dr. Lev Bocharov (Chairman of PICES)

Distinguished delegates, guests, ladies and gentlemen:

I am glad to welcome you all at the Opening Session of the 21st PICES Annual Meeting. First of all, on behalf of PICES, I would like to express my sincere gratitude to the Government of Japan, the Fishery Research Agency of Japan, the Government of Hiroshima prefecture and the Office of Hiroshima's Mayor for organizing our Annual Meeting in such a beautiful city, known for its rich historical and cultural heritage.

PICES is a multi-national and diverse organization with a wide range of scopes and aims. PICES is also an integrated organization, and its complex structure is optimized to work productively and efficiently. Scientific activity within the framework of our new integrative science program FUTURE is successfully developing and expanding. FUTURE poses fundamental and practical questions and suggests innovative approaches, I believe that PICES will achieve a lot and move forward under the auspices of this program.

An important activity within FUTURE is human dimensions, which is new to PICES. It deals with relationships between human societies and ecosystems of the North Pacific Ocean. This activity aims at providing timely

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and high quality information on climate and ecosystem changes. Such scientific support is vital for coastal communities and nations, and will help to manage marine resources effectively through the assessment of ecosystem capacity and services.

PICES plays an important role in coordinating international marine studies in the North Pacific. One of our key tasks is to conduct joint analysis of multiple data sets collected nationally and internationally. In this connection, I would like to inspire our scientists to be involved more actively into the work with PICES' metadata base.

I would like to stress that quality of PICES scientific products largely relies upon the quality of data collected at sea on research vessels. In this regard, I believe that PICES must expand coordinated multilateral field studies. In the future, we should certainly develop a Data Policy for more efficient use of unique capabilities of data sharing provided by PICES.

Ecosystem modeling is also rapidly developing in the PICES community. In this respect, validation of regional oceanic models and lower trophic modeling seem to be a promising way to move forward.

PICES continues to expand cooperation with North Pacific international scientific organizations, such as NPAFC, and with organizations from other parts of the world, for example, with ICES from the North Atlantic. Results achieved by the joint ICES/PICES Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish* are promising.

I believe that the 21st Annual Meeting of PICES will once again demonstrate a high level of research conducted by its participants, and will expand the prospects of international cooperation within the framework of our Organization for the benefit of all Pacific Rim nations.

OP Endnote 5

Science Board citation for the 2012 Wooster Award

The Wooster Award is given annually to an individual who has made significant scientific contributions to North Pacific marine science. In particular, the Award recognizes sustained excellence in research, teaching, administration or a combination of the three in the area of North Pacific marine science. It is my great pleasure to announce that Dr. Richard Beamish is the recipient of the 2012 Wooster Award.

Dick was born and raised in Ontario, a region of Canada well known for its large number of lakes. Accordingly, he decided after his undergraduate degree in Biology, to undertake graduate studies in freshwater research at the University of Toronto. Dick started his career with the Department of Fisheries and Oceans in Winnipeg, where he studied the impacts of airborne pollution on fishes, before moving to the Pacific Biological Station in Nanaimo, British Columbia, to work in the Groundfish Section. There, he recognized the importance of accurate fish age estimates and set up an Ageing Lab at the Station. With his own research, he discovered that fish were much older than previously thought, and revolutionized the age determination methods of fish, resulting in a complete rethinking of stock assessment and management.

In the 1990s, Dick decided to tackle research on Pacific salmon. He was the first to provide evidence of the synchrony between Pacific salmon production and climate, specifically atmospheric processes. In addition, he was one of the first scientists to write about North Pacific climate regimes and regime shifts. Recognizing a lifetime of outstanding achievement, dedication to the community and service to the nation, the Canadian Government awarded him with the prestigious Order of Canada in 1999, for his discovery of the effects of acid rain on fishes in Ontario lakes, his contributions to the age determination of fishes, and to the understanding of climate impacts on fishes.

Along with receiving other numerous national and provincial awards, Dick has also been recognized internationally, such as by the American Fisheries Society for the sustained excellence in marine fisheries biology, by the International Panel on Climate Change for his significant contributions that helped the Panel receive the Nobel Peace Prize for 2007, and by the Sea Fisheries Institute in Gdynia, Poland, for outstanding scientific achievements.

Dick has also made substantial contributions to the administration of science, both within Canada and in international committees. He served as Director of the Pacific Biological Station for 13 years, on the International North Pacific Fisheries Commission, was the Canadian Commissioner of the International Pacific Halibut Commission, and Chairman of the Scientific Research and Statistics in the North Pacific Anadromous Fish Commission.

In 1985, he was the President of IRIS, an organization that provided focus for international recruitment studies in the subarctic Pacific. In this capacity, he was instrumental in the formative meetings leading to the development of the North Pacific Marine Science Organization (PICES). In fact, the first formal PICES Annual Meeting (Victoria, B.C., 1992) was held in conjunction with the international symposium on “*Climate Change and Northern Fish Populations*” which was organized by Dick. All of us in the PICES community are aware of Dick’s involvement with PICES. Dick has also brought enthusiasm and mentoring to academia. From 1996 until 2011, Dick was an Affiliate Professor at Vancouver Island University in Nanaimo. For recognition of his contribution to teaching and fundraising, and for his achievements in science, he was awarded an Honorary Doctorate of Science degree from Vancouver Island University in 2009.

Dick retired in 2011 but continues research on lampreys and the factors affecting Pacific salmon production, and is currently editing a book on all aspects of the Strait of Georgia. He has had a career as a leader in marine research, with innovative approaches to ecosystem science, age determination, taxonomy, and climate change impacts on marine resources. He has published over 200 peer-reviewed journal publications, with senior authorship on 123 of these. From his publication list, there are 7 that are considered to be fisheries science ‘citation classics’. It is no wonder that even in retirement he is still travelling the globe, giving keynote addresses, providing advice and winning awards.

Ladies and Gentlemen, please join me in congratulating Dr. Dick Beamish!

OP Endnote 6

Science Board citation for the 2012 PICES Ocean Monitoring Service Award

Long-term monitoring observations are particularly critical to detecting and understanding ecosystem changes. The PICES Ocean Monitoring Service Award (POMA) was established to acknowledge monitoring and data management activities that contribute to the progress of marine science in the North Pacific. It is my great pleasure to announce that the 2012 POMA goes to the California Cooperative Fisheries Investigations (CalCOFI).

CalCOFI can trace its origins to the pioneering work on fisheries oceanography by Harald Sverdrup and Oscar Sette in the 1930s. By the time the sardine fishery was rapidly declining in the late 1940s, it was well recognized that the population dynamics of pelagic fish could not be understood without considering the effects of their environment. When the sardine industry voluntarily imposed a tax on its landings in order to answer the immediate questions of where had the fish gone and when were they coming back, it also recognized that meaningful answers would depend on a broad set of ecological observations. Thus, CalCOFI was born as a unique partnership between the fishing industry, resource management agencies and academic institutions.

A grid of CalCOFI stations that encompasses the length and breadth of the California Current was established. The geographic extent and temporal density of observations has waxed and waned over the decades depending on resources, but the commitment to CalCOFI by participating institutions, particularly the US Government,

has never wavered since 1949. CalCOFI researchers have described the bio-geographic patterns of a broad range of zooplankton and ichthyoplankton taxa, explored the effects of coastal upwelling and advection on biological productivity, described the coupling between the environment and survival of young fish, and advanced the field of fishery oceanography.

Over time, the length of CalCOFI data sets has allowed the resolution of ecological variability over a range of scales from seasonal to decadal to long-term secular change. CalCOFI has also evolved with the addition of new instrumentation and sampling protocols. Hundreds of student theses and thousands of scientific articles have used CalCOFI data sets and have built on the scientific foundation set by CalCOFI.

Over the years, other marine observation programs sponsored by the National Science Foundation, the Office of Naval Research, the Integrated Ocean Observation System, and private foundations have built on, and leveraged, the strength of the CalCOFI program. This has improved our ability to document processes in the California Current and has established the region as a model for assessing the health of marine ecosystems.

The CalCOFI Committee guides the fieldwork and publications of the program and is currently composed of representatives from Scripps Institution of Oceanography, Southwest Fisheries Science Center and California Department of Fish and Game. Please join me in congratulating Drs. Antony Koslow and Steven Bograd, receiving the award on behalf of the hundreds of people, past and present, who have contributed to the CalCOFI for the past seven decades.

OP Endnote 7

“Resilience and sustainability of the human-ocean coupled system – Beyond the Great East Japan Earthquake”
(Abstract of the keynote lecture by Dr. Tokio Wada (Executive Director, Fisheries Research Agency of Japan))

Human well-being depends on ocean ecosystems. On the other hand, human activities including fisheries, affect the structure and functions of ocean ecosystems. Natural phenomena, such as global climate changes, typhoons, storm surges, and tsunamis, also affect the ecosystem structure and functions. To achieve the sustainable use of various services from ocean ecosystems, we need to understand the ecological resilience and capacity to various disturbance factors and to adjust human activities within this capacity. To foster ecosystem resilience to natural disturbances is also the purpose of managing actions on the ocean and its living resources. In other words, we must consider that human society and the ocean ecosystem form a coupled system and it should be adjusted completely and simultaneously.

Through the activities of the Census of Marine Life (CoML) and the discussions in the COP10 of the Convention on Biological Diversity (CBD) in Nagoya in 2010, the importance of maintaining biodiversity has been recognized to achieve the sustainable use of ecosystem services. It is also acknowledged that intermediate human disturbance will stimulate the succession and renewal of ecosystems and contribute to the maintenance of biodiversity. The Japanese concept of “satoyama” means a plural ecosystem including various habitats, such as secondary forests, paddy fields, grasslands, waterways, and reservoirs which are made and maintained by the activities of agriculture and forestry. This is an example of the coupled system of human society and nature used to conserve the biodiversity and to maintain the ecosystem services under a particular anthropogenic disturbance.

While coastal ecosystems are rich in diversity due to their interaction with the adjacent land, topographic features, and hydrographic conditions, they are vulnerable and susceptible to human activities and natural disruptions. In the Japanese coastal fisheries management system, in order to spread and reduce the fishing pressure, the use of fishing grounds is temporally and spatially regulated through the granting of fishing rights amongst fishers. Activities for maintaining the ecosystem structure and functions, such as the restoration of tidal flats and seaweed beds, artificial stocking of juveniles, and development of coastal forests are also an important part of the Japanese fisheries management system. Therefore, the coastal fishery and coastal ecosystem in Japan are another example of the coupled system of human society and nature.

The enormous earthquake and subsequent tsunami that occurred on March 11, 2011 was a great calamity for the peoples and industries on the Pacific coast of the Tohoku region of Japan. Fisheries in this region were severely damaged. The earthquake and tsunami was a millennial scale disturbance for the ocean ecosystems along the Pacific coast of this area. In the offshore waters, subsidence and uplift of the seafloor occurred in a wide area around the epicenter. Along the coast, landforms and submarine topography were greatly changed by land subsidence due to the earthquake, and a large expanse of tidal flats was lost. Many seaweed beds collapsed and a large number of benthic organisms disappeared due to the tsunami. However, in the offshore waters, there was no significant difference in the migration and distribution patterns of fishes before and after the earthquake. In addition, the recovery of the seaweed beds was generally fast, and the benthic faunas have also recovered quickly. In this respect, the lethal damage from the earthquake and tsunami to the marine life was not so large, and it is suggested that the resilience of the ecosystems is fairly strong. On the other hand, the lost tidal flats and changed coastal topography appears difficult to recover naturally. These topographical changes will affect the physical, chemical, and biological processes of the coastal ecosystems, and they can lead to an ecological succession. Therefore, we need to monitor the succession carefully, and to consider ways to adapt to the succession by regulating our activities, or by using artificial measures to mitigate the ecological impacts.

As one of the effects of this earthquake and tsunami, large amounts of radioactive substances leaked into the North Pacific Ocean from the Fukushima Dai-ichi Nuclear Power Plant. The concentration of the radioactive substances, mainly ^{134}Cs and ^{137}Cs , in seawater decreased to a not detectable level within several months, even in the waters around the power plant. The radioactive contamination in the living resources of the waters off the Tohoku region has also declined to not detectable or quite low levels with time. However, in some areas, the concentrations in submarine sediments and some benthic organisms still remain at relatively high levels. We will continue to monitor the radioactive substances and examine their movement in the ocean ecosystems. In addition, a lot of debris was released by the tsunami and has been drifting across the Pacific Ocean, and some has already reached the Hawaiian Islands and coast of North America. Since the debris can affect the ecology of highly migratory species and coastal ecosystems, the systematic monitoring and ecological studies on the debris are the key issues for entire the North Pacific Ocean.

Lastly, I would like to express my sincere thanks for the warm sympathy and strong aid from the PICES member countries and from all over the world in response to the terrible disasters of the Great East Japan Earthquake.

Report of Governing Council

The Governing Council (GC) met from 9:00–16:00 hours on October 20, 2012, and from 13:00–17:00 hours on October 21, under the chairmanship of Dr. Lev Bocharov. All Contracting Parties were represented at the two sessions (*GC Endnote 1*).

AGENDA ITEM 1

Welcome and opening remarks

The Chairman called the meeting to order, welcomed the participants and requested an introduction of members for each national delegation and representatives of PICES. Dr. Bocharov noted changes in the GC membership after the 2011 PICES Annual Meeting (PICES-2011) and welcomed new national delegates, Mr. Lifeng Cui (China), Mr. Yoshiaki Takahashi (Japan), Mr. Yong-Seok Kang (Korea) and Dr. Harold Batchelder (U.S.A.) to the Organization.

The Contracting Parties were invited to make their opening remarks, and all statements are appended as *GC Endnote 2*.

In accordance with *Rule 1(ii)* of the [PICES Rules of Procedure](#), all Contracting Parties were requested to notify the Executive Secretary, three weeks in advance (by September 28), of the names of delegates, advisors, members and alternates, attending each meeting of the Organization. The Executive Secretary indicated that substantial changes in the composition of some delegations, especially for China and the United States, took place in the last two weeks prior to the Annual Meeting, and asked each Contracting Party to submit corrections to the PICES Secretariat so that Council can examine the final Delegation List at its second session.

AGENDA ITEM 2

Adoption of agenda and meeting procedures

Council reviewed and approved, without modifications, the provisional agenda circulated on September 3, 2012 (*GC Endnote 3*). This report summarizes the treatment of each agenda item during the course of the two sessions.

AGENDA ITEM 3

Membership and observers from other countries

In 2012, the Secretariat did not receive proposals from any country to accede to the PICES Convention.

The Executive Secretary indicated that after the PICES Rules of Procedure were amended to allow experts from outside of PICES to serve as *ex-officio* members on PICES Technical Committees and subsidiary bodies of PICES Scientific Committees (Decision 2009/A/5(i)), no interest in *ex-officio* membership was expressed by non-Contracting Parties. Council re-iterated its view expressed at the two previous Annual Meetings that the appropriate approaches to advertise and promote the *ex-officio* membership system and to recruit scientists from other countries to PICES, are scientist-to-scientist communication and bilateral meetings between Contracting and non-Contracting Parties. National delegates were asked to use these approaches as feasible.

The issue was raised on the necessity of an additional amendment to the Rules of Procedure to allow experts from outside of PICES to serve as *ex-officio* members on PICES Scientific Committees. Russia suggested that it would be inappropriate at this stage, and their position was supported by other Contracting Parties.

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AGENDA ITEM 4

Report on administration for 2011–2012

The Executive Secretary summarized the activities of the Organization and the Secretariat since PICES-2011. Council reviewed and adopted the report (*GC Endnote 4*).

AGENDA ITEM 5

Relations with relevant international and regional organizations/programs

The Executive Secretary reported that letters of invitation to attend PICES-2012 as observers were sent to 48 organizations and programs selected from the 2011 *Standing List of International and Regional Organizations and Programs* (with some additions), and 34 were present at the meeting (*GC Endnote 5*).

Representatives of these organizations/programs attended meetings of Science Board, Standing Committees and/or their subsidiary bodies. In particular:

- Dr. Yutaka Masuda (Vice-Chairman of IOC) and Dr. Satoru Taguchi (Vice-President of SCOR) attended the Science Board meeting on October 14 to discuss joint activities of their organizations with PICES in 2013 and beyond (details can be found in the annual report of Science Board).
- Dr. Adolf Kellermann (Head of ICES Science Programme) attended the Science Board meeting on October 19 to discuss joint activities of the two organizations and progress made within the [PICES/ICES framework for scientific cooperation](#) endorsed in 2011 (details can be found in the annual report of Science Board).
- Representatives of others organizations/programs expressed their views on potential areas of collaboration with PICES (including specific proposals for 2013 and beyond) at the meetings of Standing Committees and/or their subsidiary bodies, and the meetings of FUTURE Advisory Panels (details can be found in the annual reports of Standing Committees and expert groups).
- Several programs and organizations had posters on display outlining general information about these programs/organizations and highlighting their scientific objectives and recent activities.

The Executive Secretary also provided information on PICES representation at meetings of other programs and organizations since PICES-2011:

- Dr. Toru Suzuki (TCODE Chairman) represented PICES at the meeting of the IODE Study Group for the Ocean Data Portal (February 20–22, 2012, Oostende, Belgium);
- Dr. Phillip Mundy (MONITOR Vice-Chairman) represented PICES at the meeting of the ICES Working Group on the Northwest Atlantic Regional Sea (March 6–8, 2012, Falmouth, MA, U.S.A.);
- Drs. Toru Suzuki and Hernan Garcia (TCODE Vice-Chairman) represented PICES at the meeting of the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices (March 26–30, 2012, Oostende, Belgium).
- Dr. Mark Wells (S-HAB member) represented PICES at the meeting of ICES-IOC Working Group on Harmful Algal Bloom Dynamics (April 24–27, Oban, UK);
- Drs. Shoshiro Minobe (WG 27 Co-Chairman) and Hiroaki Saito (AP-COVE Chairman) represented PICES at the CLIVAR Pacific Implementation Panel meeting (April 29–May 1, 2012, Noumea, New Caledonia);
- Dr. Alexander Bychkov (PICES Executive Secretary) represented PICES at the 45th session of the IOC-UNESCO Executive Council (June 24–30, 2012, Paris, France) and, as a member of the International Review Committee, at the Yeosu Declaration Forum and Roundtable (August 12, 2012, Yeosu, Korea);
- Dr. Masahide Kaeriyama (AP-AICE member) represented PICES at the 12th meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (July 18–23, 2012, Sapporo, Japan);
- Drs. Skip McKinnell (PICES Deputy Executive Secretary) and Thomas Therriault (Science Board Vice-Chairman) represented PICES at the 2012 SCICOM meeting held in conjunction with the ICES Annual Science Conference (September 16–22, 2012, Bergen, Norway);

- Dr. Takeo Kurihara (WG 21 member) will represent PICES at the 17th Intergovernmental Meeting of the Northwest Pacific Action Plan (November 1–2, 2012, Jeju, Korea).

Council reviewed the progress made in the integration and coordination of PICES activities with other international scientific organizations and programs of regional and global scale, and with regional scientific and monitoring efforts (national and involving several PICES Contracting Parties) in the North Pacific, and re-confirmed its support to the holding of co-sponsored symposia/sessions/workshops/training courses, and to the creation of joint expert groups as directions of actual collaboration (see *GC Endnote 4*, Section V for details). Council also approved the revised *Standing List of International and Regional Organizations and Programs* developed by Science Board and agreed with the identified priorities for interaction in 2012–2013 (*GC Endnote 6*; Decision 2012/S/9). This list will be used, in part, to assist the Executive Secretary and Science Board in decisions regarding sending PICES representatives to meetings of other organizations and programs.

AGENDA ITEM 6

PICES Strategic Plan and Action Plans

At PICES-2011, Council unanimously adopted the [PICES Strategic Plan](#) developed by [SG-USP](#) ((Decision 2011/A/4(i)). The Plan mandates the preparation of 3-year Action Plans by Scientific and Technical Committees, Executive Committees (Finance and Administration Committee and Science Board), and the Secretariat. To monitor performance, the Action Plans have to be reviewed at each Annual Meeting, and revised if necessary.

Dr. Sinjae Yoo (Science Board Chairman) reported that Action Plans of all Scientific and Technical Committees, but MEQ, were presented and reviewed at PICES-2012. It was noted that Action Plans among the Committees lacked a consistency, with some being too detailed and others not detailed enough. It was suggested that a link to FUTURE would allow easier comparability. The Committees were requested to revise their Action Plans and submit them to FUTURE Advisory Panels by the end of January 2013. It is expected that Action Plans are finalized and presented at the 2013 inter-sessional Science Board meeting (ISB-2013).

Council briefly reviewed Action Plans for the Science Board and Finance and Administration Committee, and suggested no changes to these documents.

AGENDA ITEM 7

Yeosu Declaration and Yeosu Project

The Executive Secretary reminded that the [Ocean Expo-2012](#) was held from May 12 to August 12, 2012, in Yeosu, Korea, under the theme “*The Living Ocean and Coast*”. PICES was a major international sponsor, jointly with ICES and IOC, of the [2nd International Symposium on “Effects of climate change on the world’s oceans”](#), convened as one of the official events (the first academic event) related to the Expo-2012. The summary of the symposium and reports on all workshops convened in conjunction with the symposium are now published in the [July 2012 issue of PICES Press](#).

At PICES-2011, Council accepted an invitation for PICES to be represented on the International Review Committee (IRC) of the Yeosu Declaration pursued as the intellectual legacy of the Ocean Expo-2012 Yeosu Korea (Decision 2011/A/5(i)). In 2011–2012, the Executive Secretary, as a member of IRC, was involved in discussions and reviews of several drafts of the Declaration (54 world-renowned marine experts from world leading organizations, including PICES, have contributed to drafting and reviewing the Declaration), and participated in the Yeosu Declaration Roundtable conducted on August 12, 2012, to identify possible actions and next steps to implement the spirit of the Yeosu Declaration, and particularly, potential areas of focus for the Yeosu Project. This Project is an international cooperation program designed to strengthen capacities of developing countries in meeting the challenges related to the ocean and the environment. It is intended to be the practical element as a tool that translates the spirit of the Yeosu Declaration and the theme of Expo 2012

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Yeosu Korea to action. At the request by Dr. Bocharov, this agenda item was introduced by Dr. Dosoo Jang, Chairman of the Yeosu Declaration Preparation Committee. Main points of his presentations were later included in the [January 2013 issue of PICES Press](#).

Approximately nine million US dollars are being invested in the pilot stage of the Yeosu Project from 2009 to 2012. In 2011, PICES submitted a set of three proposals, each associated with activities of a different FUTURE Advisory Panel, but they were not funded. The Korean delegation informed Council that the National Assembly is currently evaluating the pilot phase of the Yeosu Project in order to decide the level of funding and policies for the main stage of the Project. The latter is expected to provide opportunities for international organizations.

AGENDA ITEM 8

World Ocean Assessment (UN Regular Process for Global Reporting and Assessment of the State of the Marine Environment)

At PICES-2011, Council discussed involvement of the Organization in the UN Regular Process (UNRP) for Global Reporting and Assessment of the State of Marine Environment (*aka* World Ocean Assessment) and agreed that while PICES has considerable experience and expertise in developing regional assessments, the best approach for the Organization at this time is to indicate its willingness to conduct scientific peer review of regional assessment of North Pacific marine ecosystems. In accordance with Council's Decision 2011/A/6(i), the Executive Secretary sent a letter to the Secretariat of the Regular Process, the UN Division for Ocean Affairs and the Law of the Sea (UN DOALOS), regarding PICES interest in conducting scientific peer review of UNRP regional assessments of North Pacific marine ecosystems, and in being involved in the regional workshops for the North Pacific and East Asian marginal seas. However, the response from UN DOALOS indicated that the UNRP is not designed to solicit the feedback of intergovernmental bodies, regardless of competency, because the report is developed by state-appointed experts (as a function of their membership in the United Nations).

At the request of the United States, Council reviewed recent progress made in the UNRP (a presentation was given by Ms. Elizabeth Phelps, advisor to the U.S. delegation) and discussed again the potential involvement of the Organization in the World Ocean Assessment. It was indicated that: (1) regional organizations have a role to play in advocating and enhancing opportunity and collaboration between state experts, (2) conveniently, the states responsible for the World Ocean Assessment in the North Pacific also happen to be Contracting Parties to PICES, and (3) PICES' well-established network of regional experts, with experience in integrated marine assessments, can help the region to achieve a comprehensive product. Council pointed out the importance of facilitating the conduct of the World Ocean Assessment and agreed (Decision 2012/A/8) to:

- encourage individuals in the PICES network to join the *Pool of Experts*, the body from which the *Group of Experts* will select authors and reviewers of the first World Ocean Assessment;
- promote the development of North Pacific workshop(s) to enable incorporation of regional knowledge into the first World Ocean Assessment report;
- consider means by which PICES products are visible in the World Ocean Assessment.

Council also thanked the United States for providing a voluntary contribution of \$148,200 to enhance PICES' involvement in this important endeavour.

AGENDA ITEM 9

Schedule, structure and financing of future Annual Meetings

PICES-2013

At PICES-2011, Council accepted the offer of Canada to host the Annual Meeting from October 11–20, 2013, at the Vancouver Island Conference Centre in Nanaimo, British Columbia (Decision 2011/A/7(ii)). Council

also supported the proposed theme of the meeting, “*Communicating forecasts, uncertainty and consequences of ecosystem change to society*”. At PICES-2012, Council approved the theme description developed by Science Board (Decision 2012/A/4(ii)).

PICES-2014

At PICES-2011, Council invited China to explore the feasibility of hosting the Annual Meeting in 2014, and inform the Secretariat on this matter by March 31, 2012 (Decision 2011/A/7(iii)). On March 27, 2012, a letter from Mr. Ying Wang (Director-General, Department of International Cooperation, Ministry of Agriculture) confirmed the willingness of China to host PICES-2014, with specifics to be arranged by the Ministry of Agriculture. Nevertheless, on October 12, 2012, Prof. Jilong Li (Director, Division of Academic Exchange and Cooperation, Chinese Academy of Fishery Sciences), who was designated as the focal point of MOA in liaison with PICES, informed the Executive Secretary that “*MOA feels that there are some difficulties for them to host the 2014 PICES Annual Meeting since some policy changes, but MOA still agrees to host the 2014 PICES Governing Council meeting*”. This position was re-iterated by the Chinese alternate delegate, Prof. Guohui Cui (Vice-President, Chinese Academy of Fishery Sciences) at PICES-2012.

After intensive discussion, Council requested an answer from China by the end of November 2012, regarding its ability to host PICES-2014, and agreed to consider the following options if China is unable to host the Annual Meeting in 2014: (1) asking Korea if it might be prepared to host PICES-2014 and give China the opportunity to host PICES-2015, (2) holding PICES-2014 at the seat of the Secretariat, or (3) merging the FUTURE Open Science Meeting and PICES-2014 (Decision 2012/A/4(iii)).

PICES-2015

Assuming that China agrees to host PICES-2014, Council, following the established 6-year rotation cycle, requested Korea to explore the possibility of hosting PICES-2015, and inform the Secretariat on this matter by March 31, 2013 (Decision 2012/A/4(iv)).

Structure and scientific program of Annual Meetings

At PICES-2009, Council adopted [the final report of the Study Group on Restructuring of the PICES Annual Meeting \(SG-RAM\)](#), and agreed to implement most of the approved changes in the Annual Meeting format starting with PICES-2011 (Decision 2009/A/6(i)). Due to the limited capacity of the venue in Khabarovsk, the number of concurrent sessions at PICES-2011 was 3 instead of 4 as suggested in the SG-RAM report. Considering that PICES-2012 was the first Annual Meeting for which the structure was in accordance with the entire suite of recommendations by SG-RAM, Council decided to discuss the effectiveness of the approved changes in the format of the Annual Meeting at PICES-2013 (Decision 2012/A/4(i)).

The planning and development of the scientific program for a PICES Annual Meeting has becoming increasingly complex. The Science Board Chairman reported that a new web-based system to attract, organize and evaluate proposals from scientists for topic sessions and workshops was developed by the Secretariat and presented at ISB-2012. Science Board agreed to have this system on trial for planning PICES-2013 and inter-session workshops to be held in 2013. Successes and failures in using the new system will be discussed at ISB-2013.

Financing of future Annual Meetings

At PICES-2001, Council approved the charging of a registration fee for future PICES Annual Meetings and indicated that the registration fee structure should be reviewed annually (Decision 2001/A/4(iv)). At the recommendation of the F&A Committee, Council agreed to keep the same registration fee structure for PICES-2013 as for PICES-2010 through PICES-2012 (Decision 2012/A/4(v)).

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2012 inter-sessional Science Board meeting

Holding inter-sessional meetings of Science Board and Governing Council has already become an integral part of PICES management, providing an essential opportunity for (1) making timely decisions under the current fast-changing situations in ocean science and policy, (2) mid-term reviews of scientific activities and (3) in-depth discussions on administrative issues of the Organization. The inter-sessional Science Board meetings became even more crucial after Science Board assumed the duties of the Scientific Steering Committee for the second PICES integrative science program, FUTURE.

Earlier, both the F&A Committee and Council expressed and reiterated their support for the concept of inter-sessional meetings but stressed that given meeting costs (including time commitment of the members), the need for such meetings should be evaluated each year. It was also agreed that rotating the place for inter-sessional meetings is highly desirable, especially if overall costs for the Organization are to be kept to the minimum possible. The Executive Secretary reported that this approach was implemented by obtaining financial support from the country hosting the inter-sessional meeting and by having the meeting in conjunction with other PICES events, and provided a brief summary on locations and hosts for the inter-sessional meetings and associated events.

Council approved a 2-day inter-sessional Science Board meeting to be held in spring 2013 in conjunction with a 3-day joint PICES/ICES FUTURE-related workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*”. Both events are to be hosted by Russia in St. Petersburg. It was pointed out that this approach will allow stimulating activities under the new framework for PICES-ICES scientific cooperation.

GC AGENDA ITEM 10

Preparations for the Twenty-Fifth Anniversary of PICES

The PICES Convention entered into force on March 24, 1992, and the First PICES Annual Meeting was held October 12–17, 1992, in Victoria, Canada. The Twenty-Fifth Annual Meeting will take place in 2016 and, if there are no deviations from our normal 6-year rotation cycle in hosting Annual Meetings, it will take place in the United States. At PICES-2011, Council agreed that the approaching 25th Anniversary of PICES provides an important opportunity for the Organization and its Contracting Parties to recognize the accomplishments to date and to look forward to the next 25 years. It was suggested to include this item for discussion in the agendas of Council, Science Board and F&A Committee meetings at PICES-2012.

At the recommendation of the F&A Committee, Council approved the formation of an Anniversary Planning Committee (Decision 2012/A/5), consisting of the Chairman of the F&A Committee, Chairman and Vice-Chairman of Science Board, Executive Secretary, and a representative from each of the Contracting Parties. The group’s responsibility would be to direct the planning of activities, fund-raising, and budget for this celebration. The F&A Chairman will lead the Committee and draft the terms of reference for the group (*GC Appendix B*).

AGENDA ITEM 11

Capacity building activities including PICES Intern Program

The Executive Secretary reported on capacity building events/activities organized/funded in 2012 (see Table 1 below) and plans for 2013 and beyond. [All essential components of PICES’ strategy for capacity building](#) were reviewed by Council.

TABLE 1 PICES-sponsored capacity building activities in 2012

Event/Activity	Amount	Fund
PICES/ICES Conference for Early Career Scientists (Majorca, Spain)	101,576	WCF
Travel support for 2012 Climate Change Symposium (Yeosu, Korea)	5,084	TRF
Travel support for 2012 IMBER Summer School (Ankara, Turkey)	6,409	TRF
Travel support for PICES-2012 (Hiroshima, Japan)	25,705	TRF
Demonstration workshop on “ <i>An introduction to rapid assessment survey methodologies for application in developing countries</i> ” (Nagasaki, Japan)	23,294	MAFF
HAB training course (Jakarta/Lombok, Indonesia)	42,195	MAFF
Intern Program	28,472	TRF
Total	232,735	

PICES/ICES Conferences for Early Career Scientists

The main objective for the joint PICES/ICES Conferences for Early Career Scientists (ECS) is to provide an opportunity for scientists at the beginning of their careers to meet colleagues from around the world and develop contacts and collaborations across international borders and disciplines that would persist for decades. After the success of the first conference on “*New frontiers in marine science*” (June 26–29, 2007, Baltimore, Maryland, U.S.A.), PICES and ICES agreed to hold these conferences at regular intervals (every 5 years). The second ECS conference, under the theme “*Oceans of change*”, was hosted from April 24–27, 2012, in Majorca, Spain. The conference was generously supported by ICES and PICES, with additional contributions from the National Oceanic and Atmospheric Administration (U.S.A.) and the North Pacific Research Board (U.S.A.). Underscoring the global interest in the conference, over 550 applications were received from 53 countries. With rare exceptions, 130 selected participants and organizers were less than 36 years of age or within 5 years of receiving a Ph.D. A brief summary of the conference was published in [the July 2012 issue of PICES Press](#).

Council supported suggestion of holding the third ECS conference on the western side on the North Pacific and encouraged the development of a specific proposal for discussion at PICES-2013 or ISB-2014 at the latest.

Schools on marine sciences

Council received a progress report on preparations for the 4th PICES Summer School on “*Ocean observing systems and ecosystem monitoring*” to be held August 19–23, 2013, Newport, Oregon, USA (Decision 2011/S/2(iv)), and indicated the importance of further fund raising efforts by the Secretariat. At the recommendation of Science Board, Council approved holding the 5th PICES Summer School on “*Ecological modeling*” from August 18–21, 2014, in Seoul, Korea (Decision 2012/A/3(iv)).

At PICES-2009, Science Board strongly supported PICES’ involvement in summer schools organized by large-scale ocean research programs, especially by IMBER and SOLAS. In 2012, PICES co-sponsored the IMBER ClimECO3 Summer School on “*A view towards Earth System models: Human-natural system interactions in the marine world*” (July 23–28, 2012, Ankara, Turkey) by providing travel funds and arranging additional support (through national programs/agencies) for 5 early career scientists from PICES member countries: 2 from China, 1 from Japan, and 2 from Korea. At the recommendation of Science Board, Council agreed to co-sponsor the 6th SOLAS Summer School to be held August 23–September 2, 2013, in Xiamen, China (Decision 2012/S/3(iv)).

Training courses

The Executive Secretary reported on two events organized in 2012, with funding from the Ministry of Agriculture, Forestry and Fisheries of Japan (MAFF) for the PICES project on “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” (see also Agenda Item 18):

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- One of the key activities for a component of this PICES/MAFF project conducted by the Working Group on *Non-indigenous Aquatic Species* was the organization of a series of demonstration workshops for developing countries on methodologies for rapid assessment surveys for marine non-indigenous species and collector surveys for biofouling organisms. The first workshop in this series took place on July 13–16, 2010, at the Kobe University Research Center for Inland Seas, Awaji Island, Japan, and the second workshop was organized jointly with WESTPAC from July 19–21, 2011, at the Phuket Marine Biological Center, Thailand. The third workshop, co-sponsored by FRA, NOWPAP and WESTPAC, was held February 8–9, 2012, at the Seikai National Fisheries Research Institute, Nagasaki, Japan. Over 50 participants from China, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Thailand, and Vietnam received training at these workshops.
- A component of the PICES/MAFF project conducted by the Section on *Ecology of Harmful Algal Blooms in the North Pacific* focused on teaching country-specific training courses most required to ensure seafood safety in Pacific countries outside the PICES region. A [training course](#) on screening methods for testing shellfish for paralytic shellfish poisoning toxins and phytoplankton identification was conducted in Indonesia, from February 17–22, 2012, in Jakarta, and from February 23–24, at Lombok Island. The previous two training courses were held from January 15–23, 2009, in Manila, Philippines and from February 15–19, 2010, in Guatemala City and San José, Guatemala. A follow-up training class, focused on High Performance Liquid Chromatography (HPLC) and Mass Spectrometry (MS) for domoic acid and saxitoxins was organized in collaboration with the U.S. Food and Drug Administration from April 26–29, 2010, in Guatemala City.

At the recommendation of Science Board, Council agreed to join NOWPAP in organizing the training course on “*Remote sensing data analysis*” in fall 2013, in Qingdao, China (Decision 2012/S/3(iv)). This is a follow up of the successful NOWPAP/PICES/WESTPAC training course on the same topic held October 8–12, 2011, in Vladivostok, Russia.

Travel grants

Financial support for participation of students and early career scientists in PICES Annual Meetings and symposia co-sponsored by the Organization is normally provided from the Trust Fund. Contributions to the Fund are on a voluntary basis. Efforts are being made to keep the Trust Fund at the level of \$110,000 by using transfers from the Working Capital Fund. Following the guidelines for operating the Trust Fund (Decision 2006/A/4(i)), the Executive Secretary provided a detailed report on applications received for support and their disposition. This year, a total of ~\$31,000 is expected to be spent to support the participation of scientists from all PICES member countries in the 2nd International Symposium on “*Effects of climate change on the world’s oceans*” (Yeosu, Korea) and PICES-2012. This amount includes ~\$7,500 from the Megrey Student Fund established by the family and friends of the late Dr. Bernard Megrey to provide travel awards to graduate students and early career scientists to attend PICES Annual Meetings and conferences co-sponsored by PICES with ICES and ESSAS, three major international organizations in which Dr. Megrey was actively involved. With these expenses, the Megrey Student Fund will be exhausted.

In 2013, travel support from the Trust Fund will be provided to students and early career scientists to attend the 8th Conference on Marine Bioinvasions (August 2013, Vancouver, Canada) and PICES-2013 (October 10–20, 2013, Nanaimo, Canada).

Intern Program

The [PICES Intern Program](#) aims at the professional development of marine scientists and managers from member countries and increasing the capacity of the Secretariat to support the work of the Organization. The Program was approved in 1999 (Decision 1999/A/7) and commenced in 2000. In 12 years, 13 scientists and managers from three member countries (5 from China, 5 from Korea and 3 from Russia) have worked as interns at the PICES Secretariat. The Program requires about \$28,000–33,000 per year, and has been financed solely by voluntary contributions.

Following Decision 2011/A/8(i), Contracting Parties were invited to provide voluntary contributions to support the Intern Program in 2012 and beyond. In response to this request, the U.S. National Marine Fisheries Service and Fisheries and Oceans Canada contributed \$20,000 US (\$10,000 per year in 2012 and 2013), and \$10,000 CAD, respectively, to the Trust Fund for the Intern Program. The Executive Secretary summarized the contributions and expenses since the inception of the Intern Program. The F&A Chairman pointed out that at the end of *FY* 2012, the Organization will be holding approximately \$16,900 for the Program. Considering that a remainder of the NOAA grant (\$10,000) can be claimed next year, the amount of funds should be sufficient to maintain the Program in 2013. Voluntary contributions are needed to keep it going beyond this date.

Council thanked the organizations that supported the Intern Program to date, and instructed the Executive Secretary to invite all Contracting Parties to make voluntary contributions to maintain the Program (Decision 2012/A/7(ii)). Considering funding currently available for the Intern Program and stated intentions for contributions by Contracting Parties, Council agreed to extend the period of appointment for the current intern, Dr. Zhuojun Ma (China), to a possible maximum of 12 months, and to initiate the process to obtain the 2013 intern, with the understanding that the intern's term will start no earlier than July 2013. Following the existing rotation cycle, Russia was requested to nominate the intern by January 31, 2013 (Decision 2012/A/7(i)).

GC AGENDA ITEM 12

PICES Visiting Scientist Program

At PICES-2001, Council approved the PICES Visiting Scientist Program (Decision 2001/A/6) with two main objectives: (1) to strengthen the capacity of the Organization to develop and implement projects that have high priority for PICES and Contracting Parties, and (2) to provide professional development of marine scientists and managers from Contracting Parties. It was expected that the Program will allow national agencies and/or other international science organizations to contribute “in kind” toward achieving PICES goals, and will be an alternative way to enhance the ability of the Organization and the Secretariat to support the high priority projects and increasing work demand. However, the Program has been inactive since its inception.

Following Council's Decision 2011/A/9(i), the F&A Committee reviewed and revised the description of the Program, reflecting mostly the possibility of providing additional resources for developing FUTURE products (based on recommendations from Science Board) and having scientists participate “virtually” by performing the work at their home institution or agency. Council approved the revised description (see *GC Appendix B*) and instructed the Executive Secretary to send a letter to the Contracting Parties, requesting their proposals for contributions to the Program (Decision 2012/A/6). It was also pointed out that Science Board is expected to suggest potential tasks for a visiting scientist.

AGENDA ITEM 13

Report and recommendations of the Finance and Administration Committee

The F&A Committee met from 09:00–13:30 hours on October 17, 2012, under the chairmanship of Ms. Patricia Livingston. The [full report](#) is included elsewhere in this Annual Report. All recommendations were brought forward and adopted at the first session of Council on October 20 (see *GC Appendix A*, Decisions 2012/A/1 – 2012/A/7).

AGENDA ITEM 14

Appointment of F&A Committee Chairman

According to *Rule 19(iii)* of the PICES Rules of Procedure, “The Chairman of the Finance and Administration Committee shall be appointed by the Council from among the Committee's members for a period of two years and if re-appointed, total consecutive service may not exceed four years”. Ms. Patricia Livingston (U.S.A.)

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was appointed as the F&A Committee Chairman at PICES-2008 (Dalian, China) and re-appointed for a second term at PICES-2010 (Portland, U.S.A.). This term will end at the conclusion of PICES-2012.

Council accepted the recommendation of the F&A Committee and appointed Dr. John Stein (U.S.A.) as the F&A Committee Chairman for a 2-year term (Decision 2012/A/11). Dr. Stein thanked Council members for their support. Council also expressed its gratitude to Ms. Livingston for her leadership of the F&A Committee over the past 4 years.

AGENDA ITEM 15

Improvement of participation in PICES activities

At PICES-2008, the Executive Secretary presented for the first time background graphic materials to better assess problems existing in PICES Contracting Parties with the participation of their scientists in the activities of the Standing Committees and their subsidiary bodies, and in the Annual Meetings of the Organization. At PICES-2009, Council requested that these files be updated and reviewed annually (Decision 2009/A/8(iii)). The request was re-iterated at the following Annual Meetings, including PICES-2011 (Decision 2011/A/10(ii)). At the recommendation of Canada, it was also agreed that information on the number of presentations (talks and posters) given by participating scientists from each country be added to these materials as a measure of quality of their involvement.

Information on the participation of Contracting Parties in PICES Annual Meetings for the period from 2005 to 2012 was included in the GC Briefing Book. Preliminary data as of August 26 for PICES-2012 were used to create the graphs, and these numbers have to be revised after the meeting based on actual attendance and presentations. The Executive Secretary indicated that the updated files will be provided by the end of November 2012.

Council instructed the Executive Secretary to continue regularly preparing and circulating to Contracting Parties information, including graphic materials, on the participation of their scientists in the Annual Meetings for the previous six years (Decision 2012/A/9(i)).

Council also re-iterated the necessity for Contracting Parties to: (1) regularly review their national membership, and to provide the updated national membership list to the Secretariat by the first day of the calendar year (January 1), and (2) follow up on *Rule 1(ii)* of the PICES Rules of Procedure in providing the national delegation list for Annual Meetings (Decision 2012/A/9(ii)). The national membership lists are required to maintain a historical record of PICES membership, and to assist in improving participation in the activities of the Organization. The national delegation lists are required to assist in better coordinating activities of the Standing Committees and their subsidiary bodies, and in better preparing the Annual Meeting.

Brief discussion took place on mechanisms of inter-agency coordination for participation in PICES activities. PICES can only strongly recommend that this problem be recognized and solved at the national level to ensure that an agency that has the principal responsibility for interaction with PICES represents the interest of other agencies and coordinate PICES interactions with them, and promotes activities within PICES that have high national interest and relevance.

AGENDA ITEM 16

Progress report on implementation of the second PICES integrative science program

The second integrative scientific program of PICES, [FUTURE](#) (*Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Ecosystems*) is the major enterprise and the highest priority undertaking of the Organization for the period from 2009–2020. The basic principles of the program are contained in the Science Plan approved in principle at PICES-2007 (Decision 2007/S/1), and finalized in

February 2008. The FUTURE Implementation Plan was approved in principle at IGC-2009 (Decision 2009/S/1) and finalized in June 2009. Both documents are available on the PICES website, along with terms of reference for three FUTURE Advisory Panels, AICE (*Anthropogenic Influences on Coastal Ecosystems*), COVE (*Climate, Oceanographic Variability and Ecosystems*) and SOFE (*Status, Outlooks, Forecasts, and Engagement*) established to provide continuing direction, leadership, coordination, and synthesis within PICES toward attaining FUTURE goals. These Advisory Panels are expected to recommend specific activities for consideration by Science Board which serves as the Scientific Steering Committee (SSC) for FUTURE (Decision 2009/S/7(i)).

A progress report on the implementation of FUTURE was presented to Council by Dr. Sinjae Yoo, Chairman of Science Board. He pointed out that with the establishing of several new expert groups in 2010–2011 and the revisions to the terms of reference of the existing expert groups, the Program now has the minimal number of groups required to undertake the tasks identified in the FUTURE Science Plan and Implementation Plan.

The following events were organized in 2012 to advance FUTURE science:

- Understanding the roles and responsibilities of each expert group within the FUTURE framework and conducting the necessary work in concert with other groups in a timely manner are vital for the success of the Program. A 2.5-day inter-sessional workshop was held May 22–24, 2012, in Busan, Korea, to develop a higher level coordination plan where tasks and roles of expert groups, information flows, and products were specified and aligned. A [brief report](#) on what has been discussed and planned during this meeting was published in the 2012 summer issue of PICES Press.
- A 2-day [workshop](#) on “*Climate change projections for marine ecosystems: Best practices, limitations and interpretations*”, led by PICES WG 29, was held on May 13–14, 2012, preceding the 2nd International Symposium on “*Effects of climate change on the world’s ocean*” in Yeosu, Korea. The goal of the workshop was to explore different approaches to modeling the impacts of climate change and variability on marine ecosystems and to highlight their strengths and limitations. A significant motivation was to bring together both global and regional modelers whose communities often work separately. A review manuscript on state-of-the-art approaches for making projections of particular ecosystems is expected as the outcome from the workshop.
- A [4-day Theme Session](#) on “*Climate change effects on living marine resources: From physics to fish, marine mammals, and seabirds, to fishermen and fishery-dependent communities*”, led by PICES/ICES SICCME, was convened on May 16–19, 2012, at the 2nd International Symposium on “*Effects of climate change on the world’s ocean*” in Yeosu, Korea.
- A GLOBEC/PICES/ICES workshop on “*Forecasting ecosystem indicators with process-based models*”, led by PICES WG 27, was held September 7–11, 2012, in Friday Harbor, WA, U.S.A. The goal of this workshop was to identify and model key processes that enable to succinctly and quantifiably explain the mechanisms underlying the correlative relationships in physical-biological datasets, both in the North Pacific and North Atlantic. A set of 10 examples of diagnostic and predictive ecosystem process models of different degrees of complexities were presented and discussed along with a review of the modeling methodologies currently available for process modeling. The [workshop report](#) can be found on the WG 27 website.
- A PICES/ICES Theme Session on “*Understanding, measuring and projecting the limits of resilience in marine ecosystems*” was convened on September 18, 2012, at the 2012 ICES Annual Science Conference in Bergen, Norway.
- FUTURE-related activities scheduled for PICES-2012 included:
 - A ½-day joint meeting of FUTURE Advisory Panels and ½-day concurrent meetings of each Panel to review work plans;
 - A 1-day MEQ/FUTURE Topic Session on “*Social-ecological systems on walleye pollock and other commercial gadids under changing environment: Inter-disciplinary approach*”;
 - A ½-day BIO/MEQ/FUTURE Topic Session on “*Ecosystem responses to multiple stressors in the North Pacific*”, co-sponsored by SOLAS;
 - A ½-day MEQ/FUTURE Topic Session on “*Risk management in coastal zone ecosystems around the North Pacific*”.

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A special emphasis in Dr. Yoo's presentation was on a FUTURE Roadmap (a higher level coordination plan where tasks and roles of expert groups, information flows, and products are specified and aligned) and a FUTURE Open Science Meeting (OSM).

Council reviewed the FUTURE Roadmap proposed by Science Board (a draft Roadmap developed based on the outcomes from the 2012 inter-sessional workshop in Busan, Korea, was finalized at PICES-2012), and agreed with recommended activities and timelines for FUTURE, with the addition of a footnote, proposed by Korea, to the suggested timeline of delivering the next edition of the North Pacific Ecosystem Status Report (NPESR-3), stating "under the condition that NPESR-2 is fully completed" (Decision 2012/S/1(i)).

Council approved holding the FUTURE OSM in spring 2014 (Decision 2012/S/3(i)). By 2014, FUTURE will be 5 years old, and the OSM is intended to provide an opportunity to assess what has been achieved and to make necessary course adjustments for the remaining years to fulfil the objectives of the program. After the OSM, an evaluation team consisting of PICES and external experts will gather to make a formal assessment of FUTURE progress.

Council also supported other FUTURE-related activities recommended by Science Board for 2013–2014 (Decision 2012/S/2 and 2012/S/3):

- A 3-day joint PICES/ICES workshop on "*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*" to be held in conjunction with the inter-sessional Science Board meeting in May 2013, in western Russia. This workshop will stimulate S-CCME activities under the new framework for PICES-ICES scientific cooperation.
- A 2-day joint PICES/ICES workshop on "*Development and application of Regional Climate Models-IP*" to be held in Seoul, Korea. This workshop will be a follow-up of the meeting convened in October 2011, and will stimulate WG 29 activities under the new framework for PICES-ICES scientific cooperation.
- A joint ICES/PICES Theme Session, led by S-CCME, on climate induced shifts in spatial distributions to be held at the 2013 ICES Annual Science Conference;
- A PICES-2013 Science Board Symposium on "*Communicating forecasts, uncertainty and consequences of ecosystem change*";
- A 1-day joint PICES/ICES workshop, led by WG 27 and AP-COVE, on "*Isolating mechanisms linking physical climate and ecosystem change*" to be held at PICES-2013;
- A 1-day joint PICES/ICES workshop, led by S-CCME, on "*Comparison of size-based and species based ecosystem models*" to be held at PICES-2013.

A special fund to support FUTURE was established at PICES-2007 when Council agreed to earmark \$40,000 of the encumbered funds designated for high-priority PICES projects for the development of the program (Decision 2007/A/3(v)). The evolution of the FUTURE fund was presented by the Executive Secretary. Considering the estimated year-end balance for this fund and the number of activities identified by FUTURE, Council approved the recommendation of the F&A Committee that funds available from all completed projects in the Working Capital Fund as of December 31, 2012, be allocated for the development of FUTURE (Decision 2012/A/3(v)). Council also requested that the Executive Secretary send a letter to the Contracting Parties providing information on planned activities for FUTURE and requesting contributions to these activities, particularly for the 2014 FUTURE OSM (Decision 2012/S/1(ii)).

AGENDA ITEM 17

Report of Science Board

The Science Board met from 12:30–14:00 on October 14, from 15:00–18:00 hours on October 19, and from 8:30–18:00 hours on October 20, under the chairmanship of Dr. Sinjae Yoo. Dr. Yoo presented the report to Council on October 21. The [full report](#) is included elsewhere in this Annual Report. The decisions on scientific issues are summarized in *GC Appendix A* (Decisions 2012/S/1–2012/S/9) and *GC Appendix B*. The discussion on a Study Group on *Radionuclide Science in the North Pacific Ocean* (SG-RS) is reflected below.

The Science Board Chairman informed Council that China proposed to form a new Working Group on *Assessment of Marine Environmental Quality of Radiation around North Pacific*, under the direction of the Marine Environmental Quality Committee (MEQ). After reviewing this proposal, Science Board agreed that an opportunity has to be provided for a wider discussion of the proposal among scientists in member countries, and recommended the establishment of a Study Group on *Radionuclide Science in the North Pacific Ocean* (SG-RS), with the terms of reference and life span as follows:

1. To convene a workshop in China to provide a forum for exchange of views among scientists on the idea of developing a scientific focus on understanding the quantities and distributions of radionuclides in the North Pacific;
2. To refine the terms of reference for the Working Group on *Assessment of Marine Environmental Quality of Radiation around North Pacific* proposed by China in consideration of wider interests of scientists in PICES member countries, including relevance to the FUTURE/AICE mandate;
3. To develop a list of potential Working Group members;
4. To prepare a report with recommendations for future PICES activities and products related to the topic that are consistent with new MEQ Action Plan;
5. To make the final report available by the inter-sessional Science Board meeting in May 2013.

China indicated the willingness to host the SG-RS meeting/workshop, if this expert group is approved. After intensive discussion, five Contracting Parties supported the establishment of the Study Group, and Japan requested time by the end of November 2012 for consultations with various agencies involved in radionuclide research and monitoring in their country. After deliberations, Council agreed with this request.

On November 21, 2012, Dr. Ichiro Nakayama informed the Chairman of PICES that Japan does not oppose the formation of SG-RS “*as far as the activity of the Study Group is conducted from a purely scientific viewpoint*”. Thus, consensus required for the establishment of the *ad-hoc* scientific group by [the PICES Convention](#) (see Article VII, 4(a)) was reached, and SG-RS was approved (Decision 2012/S/7; *GC Appendix B*).

AGENDA ITEM 18

Report on PICES projects supported by the Japanese Trust Fund

2007–2012 PICES/MAFF project

In April 2007, the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan (JFA), approved funding for a 5-year PICES project entitled “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*”. The goals of the project (completed March 31, 2012) were to develop international systems to collect, exchange and store relevant data, and to foster partnerships with non-PICES member countries and related international organizations. The contribution was from the Official Development Assistance (ODA) fund, and involvement of developing Pacific Rim countries was required in activities under this project.

The Executive Secretary informed Council on activities under the project since PICES-2011 and provided a summary on fund transferring and project reporting:

- Funds for *Year 1* of the project (completed on March 31, 2008) in the amount of \$184,980 were transferred to the PICES/MAFF bank account on July 27, 2007. The progress report and the financial report for *Year 1* were submitted to JFA on July 19 and July 23, 2008, respectively.
- Funds for *Year 2* of the project (completed on March 31, 2009) in the amount of \$161,466 were transferred to the PICES/MAFF bank account on July 17, 2008. The financial report for *Year 2* was submitted to JFA on July 21, 2009, and the progress report was sent on August 13, 2009.
- Funds for *Year 3* of the project (completed on March 31, 2010) in the amount of \$187,505 were transferred to the PICES/MAFF bank account on July 15, 2009. The progress report and the financial report for *Year 3* were submitted to JFA on July 26, 2010.

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- Funds for *Year 4* of the project (completed on March 31, 2011) in the amount of \$187,505 were transferred to the PICES/MAFF bank account on July 12, 2010. The financial report and the progress report for *Year 4*, as well as handouts summarizing activities within two sub-projects by the end of *Year 3* were sent to JFA on July 28, 2011.
- Funds for *Year 5* of the project (completed on March 31, 2012) in the amount of \$164,641 were transferred to the PICES/MAFF bank account on July 27, 2011. The financial report for *Year 5* (see *GC Appendix 7*) was submitted on June 20, 2012. Final scientific reports and outreach brochures for both project components were submitted on August 2. Due to seriously delayed business procedures, two other project products, the MNIS database and “*Atlas of Non-indigenous Marine and Estuarine Species in the North Pacific*” became available on October 10 (this deadline was accepted by MAFF/FRA), and a USB with the Atlas and a read-only version of the database in Access 2003 and Access 2007 formats (with installations provided for each of these formats for two operating systems, Windows XP and Windows Vista) will be handed to MAFF/FRA at PICES-2012.

Japan expressed their satisfaction with the implementation of the project. Council thanked Japan for their generous contribution and re-iterated that this project was successful not only in accumulating new scientific knowledge and building capacities within PICES and developing countries, but also in providing support for daily operations of the Secretariat through the agreed 13% overhead.

2012–2017 PICES/MAFF project

The Executive Secretary reported on a new 5-year PICES project supported by the Japanese Trust Fund. In December 2011, MAFF, again through JFA, approved funding the project on “*Marine ecosystem health and human well-being*”. The goal of this project (to be completed by March 31, 2017) is to identify the relationships between sustainable human communities and productive marine ecosystems in the North Pacific, under the concept of fishery social-ecological systems (in Japan, this concept attracts attentions as the “*Sato-umi*” fisheries management system). Specifically, considering the global changes in climate and human social and economic conditions, the project is expected to determine: a) how do marine ecosystems support human well-being and b) how do human communities support sustainable and productive marine ecosystems. This contribution is from the Official Development Assistance (ODA) Fund and therefore, it is required to involve developing Pacific Rim countries in activities under this project.

The following organizational principles agreed by MAFF/JFA and PICES apply to the project:

- The project will be directed by a Project Science Team, co-chaired by two PICES scientists and with membership from additional PICES (and non-PICES) members, as deemed appropriate. The Project will have strong connections and interactions with, and involve and support the activities of, relevant PICES expert groups.
- The Co-Chairmen of the Project Team will serve as the Project Scientific Coordinators and are responsible for reporting annually to the PICES Science Board on the scientific implementation of the project. This report should include a summary of the activities carried out in the year, with an evaluation on the progress made, and a work plan for the following year. The report should be submitted to JFA within 120 days after the close of each project year ending March 31.

Members of the Project Science Team were identified in August 2012. The current membership includes 13 scientists: 3 from Canada, 3 from Japan, 2 from Korea and 4 from USA, and a representative from the PICES Secretariat (<http://www.pices.int/projects/MarWeb.aspx>). A total of 6 PICES expert groups are represented on the Team: Section on *Human Dimensions of Marine Systems* (S-HD), Section on *Harmful Algal Blooms in the North Pacific* (S-HAB), Section on *Climate Change Effects on Marine Ecosystems* (S-CCME), Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28), Working Group on *Non-indigenous Aquatic Species* (WG 21), and FUTURE Advisory Panel on *Status, Outlooks, Forecasts, and Engagement* (AP-SOFE). The Team is co-chaired by Drs. Mitsutaku Makino (Fisheries Research Agency, Japan, mmakino@affrc.go.jp) and Ian Perry (Fisheries and Oceans Canada,

Ian.Perry@dfo-mpo.gc.ca). The first meeting of the Team was held October 11, 2012, in conjunction with PICES-2012.

The financial principles agreed by MAFF/JFA and PICES for the project are similar to the principles for the first project.

The set of documents requesting funding for *Year 1* of the project (to be completed on March 31, 2013) was sent to the Consulate General of Japan in Vancouver (Canada) on June 10, 2012, and funds in the amount of \$149,880 were transferred to the PICES/MAFF bank account on August 14.

AGENDA ITEM 19

Report of the Executive Committee for evaluating annual performance of the Executive Secretary

At the recommendation of the United States and in accordance with *Financial Regulation 12(i)*, an Executive Committee of Council for evaluating the annual performance of the Executive Secretary was established at PICES-2007 (Decision 2007/A/7(i)). The terms of reference and membership of the Committee are listed in [2007 GC Appendix B](#).

The Chairman informed Council that the Executive Committee reviewed the 2011 report submitted by the Executive Secretary and evaluated his annual performance as “succeeded+” not only for his ongoing commitments but also for the key commitments specifically requested by the PICES Chairman. Following the general guidelines for executive positions in the Canadian Public Service system, it was decided that a performance pay equal to 12% of his salary would be appropriate for this period.

The PICES Executive Secretary position was advertised last time in 1998. Dr. Alexander Bychkov was appointed to this position for a 5-year term starting June 1, 1999. He was re-appointed for a second 5-year term (June 1, 2004 to May 31, 2009) in 2002, and for a third 5-year term (June 1, 2009 to May 31, 2014) in 2008. Recognizing that his term was due to expire and that a decision was required at least 12 months prior to the end of the current term, the Executive Committee considered several options in regard to the Executive Secretary position and recommended that the following two options be advanced for discussion and approval by Council: (1) to re-appoint Dr. Bychkov for another 5-year term, and (2) to extend Dr. Bychkov’s term until December 31, 2016, allowing him to have 20 years of service to PICES (including 3 years as the Assistant Executive Secretary) and to organize and run the 25th Anniversary Annual Meeting). These two options were reviewed, and Council agreed to extend Dr. Bychov’s current term until December 31, 2014 (Decision 2012/A/12(i)) as an interim measure. The discussion regarding these options must be continued at PICES-2013.

The report on the performance evaluation of the Executive Secretary for 2011, with tasks for 2012, is appended as *GC Endnote 8*.

AGENDA ITEM 20

Election of Chairman and Vice-Chairman of PICES

According to *Rule 6* of the Rules of Procedure, “The Chairman and the Vice-Chairman shall each be elected from among the delegates for a term of two years and each shall be eligible for re-election only once for a successive term”.

Dr. Lev Bocharov (Russia) was elected as the Chairman of Council at PICES-2010 (Portland, U.S.A), and his first term will end at the conclusion of PICES-2012. In May 2012, Dr. Bocharov informed the Secretariat that he will not seek a second term and will step down as the Chairman after PICES-2012. A call for nominations was circulated to Contracting Parties on May 31, and only one nomination was received by the August 16 deadline. Dr. Laura Richards, Canadian national delegate and current PICES Vice-Chairman, was nominated by

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Dr. David Gillis (Director General, Ecosystem Science, Fisheries and Oceans Canada). At the meeting, Council unanimously elected Dr. Richards as the Chairman (Decision 2012/A/10(i)).

Considering that the Vice-Chairman position became vacant after the election of Dr. Richards, the Chairman called for nominations for this position. Dr. Chul Park, Korean national delegate, was nominated and unanimously elected as the Vice-Chairman (Decision 2012/A/10(ii)).

Delegates thanked Dr. Bocharov for his leadership and efforts over the last two years. As he will resume his duties as the Russian national delegate, Council agreed that Dr. Tokio Wada (Japan) will continue to serve as the Past-Chairman (Decision 2012/A/10(i)). Drs. Richards, Park and Wada expressed their gratitude for the support given by Council.

GC Endnote 1**Participation list**Canada

Laura Richards (GC and F&A member)
Darlene Smith (advisor)

Japan

Yukimasa Ishida (advisor)
Kosuke Kiga (advisor, Oct. 21 only)
Ichiro Nakayama (GC member)
Hiroyuki Shimada (advisor, F&A member)
Yoshiaki Takahashi (GC member)

People's Republic of China

Guohui Cui (alternate delegate, CAFS/MOA)
Chuanlin Huo (advisor, Oct. 20 only)
Ningsheng Yang (advisor)
Wenbo Yang (advisor, Oct. 21 only)
Rui Zheng (alternate delegate, SOA)

Republic of Korea

Dosoo Jang (advisor)
Yong-Seok Kang (GC and F&A member)
Chul Park (GC and F&A member)

Naesun Park (advisor)

Gidong Yeo (advisor)

Ungyul Yi (advisor)

Russian Federation

Vladimir Radchenko (GC member)
Tatiana Semenova (advisor, Oct. 20 only)
Igor Shevchenko (advisor, F&A member)

United States of America

Harold Batchelder (GC member)
Elizabeth Phelps (advisor)
John Stein (GC and F&A member)

Other

Lev Bocharov (PICES Chairman)
Tokio Wada (PICES Past Chairman)
Patricia Livingston (F&A Chairman)
Sinjae Yoo (Science Board Chairman, Oct. 21 only)
Alexander Bychkov (Executive Secretary)
Stewart McKinnell (Deputy Executive Secretary,
Oct. 21 only)

GC Endnote 2**Opening remarks by representatives of Contracting Parties**Dr. Laura Richards (Regional Director of Science, Pacific Region, Fisheries and Oceans Canada)

Mr. Chairman: On behalf of Canada and the Canadian delegation, I would like to thank the Government of Japan and the Fisheries Research Agency for hosting PICES-2012 in Hiroshima. We especially appreciate the hard work of the National Research Institute of Fisheries and Environment of Inland Sea, along with the Secretariat in making this meeting a success.

PICES is an impressive organization. This fact becomes evident to me each year as the Science Board Chairman reviews the long list of annual achievements at the PICES Opening Session. Our challenge will be to ensure that all this activity stays focused on the goals of the PICES Strategic Plan so that marine science in the North Pacific can continue to progress. We also know that FUTURE is a complex program, and we will need to pay close attention to ensure its success.

We also need to consider opportunities to demonstrate the importance and relevance of PICES to our governments. I would like to take this opportunity to congratulate our fellow delegate Dr. Vladimir Radchenko on his appointment as the Executive Director of the North Pacific Anadromous Fish Commission (NPAFC), and I hope that his in-depth knowledge of PICES and NPAFC will lead to collaborations that foster the needs of both organizations. The new North Pacific Fisheries Commission (NPFC) held its first science committee meeting in Juneau in August, and I anticipate that PICES will be well-placed to provide useful advice to NPFC should a need arise.

Unfortunately, the world's economies are continuing to struggle from the economic downturn and this reality will likely slow our progress. Last year, I reported to you that my Department of Fisheries and Oceans faced a

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3% budget reduction. Last spring, following a review of all government departments, my department's budget was reduced by an additional 5.8%. Then, just last week, we learned of further restrictions on travel. Together, these actions mean that the Canadian delegation will likely be smaller at forthcoming PICES events. I know that other government agencies face similar pressures. And, while Canada will continue to support PICES, we may not be able to provide the same level of participation or voluntary contribution as in the past. I make these points to emphasize that more than ever, PICES must stay focused on its goals and deliver products as efficiently as possible.

Next year, I have the pleasure of hosting PICES 2013 in my home town of Nanaimo, BC. I look forward to welcoming you all there and sharing with you some of the many things to see and do in the local area. Thank you.

Ms. Rui Zheng (Department of International Cooperation, State Oceanic Administration, People's Republic of China)

Dear Mr. Chairman and Executive Secretary, ladies and gentlemen: It is my great pleasure to be here as the representative of the State Oceanic Administration (SOA) of China to participate in the Governing Council meeting of the 2012 Annual Meeting of PICES. I would like to express our appreciation to the organizers and Secretariat for their effort to guarantee the success of the meeting.

The Chinese Government launches great importance to the marine development, including the integrated marine management, marine ecological civilization establishment and marine scientific research development. We attempt to keep marine economic improvement as well as marine sustainable development.

As a member state of PICES, we perform the duties effectively and make our contribution to PICES. SOA, as an integrated government agency for marine affairs in China, does care about the development and management of PICES, and we are willing to play a more active role in the relevant issues in PICES, such as activities of existing expert groups, establishing new expert groups as needed, and encouraging scientists of SOA to participate actively in all the programs of PICES.

After several years' effort, PICES has become one of the important inter-governmental organizations in the world. We would like to continue our effort for PICES and work together with other member countries for a better tomorrow of PICES.

Last but not least, I would like to thank all the member countries and the organizers again, and wish the meeting a great success. Thank you.

Mr. Yong- Seok Kang (Director, Marine Development and New Growth Division, Ministry of Land, Transport and Maritime Affairs, Republic of Korea)

On behalf of the Korean Government and scientists, I appreciate the efforts of the Japanese Government and the PICES Secretariat for the efforts to lead the 2012 PICES Annual Meeting to a great success.

I also want to thank Contracting Parties who supported the 2nd PICES/ICES/IOC International Symposium on "*Effects of climate change on the world's oceans*" and the Expo 2012, which took place from May 12 to August 12, 2012, in Yeosu, Korea, under the theme "The Living Ocean and Coast".

Since its inception in 1992, PICES made a great stride in our understanding of marine ecosystems. Outcomes, as very useful information and insightful references, are serving governments, scientists and international organizations within and outside the region.

For climate change and other reasons, marine ecosystems are rapidly and constantly changing. The rapidity poses a threat to the entire human race, including us in the North Pacific region. Foreseeing the change and finding a way-out is the mandate of us in the name of PICES. The theme of this year's Annual Meeting, "*Effects of natural and anthropogenic stressors in the North Pacific ecosystems: Scientific challenges and possible solutions*" is just as timely and considerate as previous meetings.

Well aware of the importance of understanding the North Pacific marine ecosystem, Korea will play a due role in the implementation of the second PICES integrative scientific program, FUTURE.

In closing, I renew my gratitude to the Secretariat and the host country and wish for the progress of PICES through Contracting Parties' pure-hearted patronage and close cooperation.

Dr. Vladimir Radchenko (Deputy Director-General, Pacific Research Fisheries Centre (TINRO-Centre), Russian Federation)

Dear Mr. Chairman, distinguished delegates, ladies and gentlemen: We are very pleased to continue our fruitful work in the beautiful city of Hiroshima. The scientific program of the 2012 PICES Annual Meeting was very diverse and comprehensive. Moreover, all sessions and workshops were well-attended and well-executed. I hope that these last two days of the meeting will also go smoothly for our mutual benefits.

The 2011 PICES Annual Meeting was held in Khabarovsk, and there are still several years until our turn will come to host such a sound conference again. But we do not like to stay idle and are happy to invite all Contracting Parties to participate in the inter-sessional Science Board meeting and the PICES/ICES workshop on "*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*" to be convened in the western part of Russia in the spring of 2013.

We appreciate the efforts of the Government of Japan, the PICES Secretariat and the Local Organizing Committee in making this Annual Meeting such a success. The local museum of art made a deep impression and left a feeling of admiration in our hearts. It is a sign of a high level of preparation, kindness and good taste.

Dr. John Stein (Director, Northwest Fisheries Science Center, NOAA-Fisheries, U.S.A.)

Thank you, Mr. Chairman: I would like to open my remarks by acknowledging the efforts of Dr. George Boehlert as US Delegate to PICES and his overall outstanding service to PICES. We will miss Dr. Boehlert's participation and his advice to Governing Council, but wish him well in his retirement. While Dr. Boehlert is hard to replace, we have a very capable individual in Dr. Harold (Hal) Batchelder, who was selected to fill the position held by Dr. Boehlert on the US Delegation. Dr. Batchelder has a long standing in PICES and now brings that valuable experience to Governing Council.

Turning now to this Annual Meeting, on behalf of the United States I want to thank the Japanese Government, the sponsoring agencies, the Local Organizing Committee and the PICES Secretariat for hosting the 2012 PICES Annual Meeting in the beautiful city of Hiroshima. The venue was excellent for the Annual Meeting, and the high quality of the science program attests to the continued growth in the relevance of PICES science to important societal issues in all PICES member countries. At this meeting in Hiroshima, we observed that the next generation of PICES scientists is emerging to lead PICES science into the future, which is very encouraging. We also are finding that our science program FUTURE, a very ambitious and cutting-edge science program, is making steady progress. At this meeting, significant progress was made in advancing the goals of FUTURE.

The Annual Meeting program also included excellent presentations on what we have learned from past and recent natural and human-induced disasters, and in particular, the devastating effects of the Great East Japan Earthquake. On behalf of the US Government, I want to acknowledge the cooperation between Japan and the

US to address impacts after the earthquake and tsunami, and in particular the excellent cooperation between our two countries on the issue of marine debris.

The Great East Japan Earthquake also exemplifies the value of PICES as the international science organization for fostering cooperation in the North Pacific in response to natural disasters and for global issues affecting all our member countries, such as global climate change. But there are external forces that are affecting support of ocean science in the US. For the US and other member countries, the slow economic recovery is placing significant pressures on our ability to support ocean sciences at the same level as we have in the recent past. This has some effects on science activities relevant to PICES, such as participation by US scientists in this PICES Annual Meeting. The current situation, however, does not change the US commitment to supporting the science programs and activities of PICES.

In closing, the US wants to again thank the Government of Japan for hosting an outstanding PICES Annual Meeting in Hiroshima. We also want to affirm the critical value of PICES as the premier scientific organization for marine ecosystem science in the North Pacific, a region that delivers critical ecosystem goods and services to all our countries, and supports biodiversity important to a sustainable future. Nonetheless, there are significant pressures on the delivery of ecosystem goods and services, particularly in the coastal and marginal seas, that will benefit from the continued high quality science of PICES. It is therefore important to maintain our commitment to international science cooperation and disseminating resulting science products from the activities and programs of PICES. These observations lead me to conclude that PICES science is flourishing.

Mr. Yoshiaki Takahashi (Director, Foreign Policy Bureau, International Science Cooperation Division, Ministry of Foreign Affairs, Japan)

Dear Mr. Chairman: We are very honored to host the 2012 PICES Annual Meeting here in Hiroshima and welcome you coming all the way to Japan.

First, on behalf of the Government of Japan and its delegation we would like to express our sincere gratitude to all the assistance received from the Contracting Parties after the Great East Japan Earthquake last year. In the aftermath of this disaster, we are still facing difficult problems, but all-out efforts are being made for the reconstruction of our country.

We sincerely hope that the meeting will be productive and meaningful and achieve a great success. Thank you.

GC Endnote 3

Governing Council meeting agenda

1. Welcome and opening remarks by representatives of Contracting Parties and the Chairman of PICES
2. Adoption of agenda and meeting procedures
3. Membership and observers from other countries
4. Report on administration for 2011–2012
5. Relations with relevant international and regional organizations/programs
6. PICES Strategic Plan and Action Plans
7. Yeosu Declaration and Yeosu Project
8. World Ocean Assessment (UN Regular Process for Global Reporting and Assessment of the State of the Marine Environment)
9. Schedule, structure and financing of future Annual Meetings
10. Preparations for the Twenty-Fifth Anniversary of PICES
11. Capacity building activities including PICES Intern Program
12. PICES Visiting Scientist Program
13. Report and recommendations of the Finance and Administration Committee

14. Appointment of F&A Committee Chairman
15. Improvement of participation in PICES activities
16. Progress report on implementation of the second PICES integrative scientific program, FUTURE
17. Report and recommendations of the Science Board
18. Report on PICES projects supported by the Japanese Trust Fund
19. Report of the Executive Committee for evaluating annual performance of the Executive Secretary
20. Election of Chairman and Vice-Chairman of PICES
21. Other business

GC Endnote 4

Report on Administration for 2011–2012

I. Managing the budget and implementing financial regulations of the Organization

- The *FY 2011* operations were completed within budget and with pre-agreed parameters. The financial statements were submitted to the auditor on March 26, 2012, and the audit was completed on May 3. The electronic copy of the Auditor's Report was circulated to all Contracting Parties on May 4. In the auditor's opinion, "*the financial statements present fairly, in all material respects, the financial position of the North Pacific Marine Science Organization as at December 31, 2011, and the results of its operations and changes in fund balances for the year then ended*". Details are reflected under *FA Agenda Item 3*. It is expected that the *FY 2012* operations will be also completed within budget and with pre-agreed parameters. The audit for *FY 2012* will be conducted in March–April 2013.
- According to *Regulation 5* of the PICES Financial Regulations, all national contributions to PICES are payable by the first day of the fiscal year (January 1) to which they relate. All Contracting Parties met their financial obligations for *FY 2012*. Details can be found under *FA Agenda Item 4*.
- As current funding constraints from an increase in annual contributions only at the rate of inflation in Canada can impede improvement and development of the Organization, fund-raising continues to be an important component of PICES activities. The level of external funding has increased significantly over the last several years. In 2010 (for the first time), 2011 and 2012, the amount of funds from voluntary contributions, grants and partnerships for various activities initiated or sponsored by PICES exceeded the total annual contribution by Contracting Parties, indicating the Organization's large dependence on outside funding offers, most of which have specific product and service requirements. Special emphasis was put on fund raising for the Second International Symposium on "*Effects of climate change on the world's oceans*" (Yeosu, Korea), capacity development activities, and the North Pacific Continuous Plankton Recorder (CPR) survey. Details are reflected under *FA Agenda Item 5*.

II. Planning and organizing the 2012 PICES Annual Meeting

PICES Annual Meetings are crucial for the Organization to move forward in achieving its mandate "to promote and coordinate marine scientific research in order to advance scientific knowledge of the area concerned". These meetings, with their high scientific standards, wide variety of topics and good attendance, have become major irreplaceable international fora for marine sciences in the North Pacific.

- The 2012 Annual Meeting (October 12–21, Hiroshima, Japan) was hosted by the Government of Japan, in cooperation with the Fisheries Research Agency (FRA) and in coordination with the PICES Secretariat. Local arrangements were made by the National Research Institute of Fisheries and Environment of Inland Sea (FEIS) of FRA. The PICES-2012 theme was "*Effects of natural and anthropogenic stressors in the North Pacific ecosystems: Scientific challenges and possible solutions*", and the meeting [scientific program](#) covered a broad range of timely and very relevant marine science issues. Almost 470 scientists and managers from 22 countries and 34 international and regional organizations and programs attended the meeting. A total of 17 scientific sessions, 8 workshops and 25 business meetings of our committees and expert groups took place (see *Appendix 1* for the complete list), and 263 talks and 150 posters were presented. Many of these [presentations](#) can be found on the PICES website.
- To get a more comprehensive picture on the Annual Meeting's theme and to secure funding, several international organizations/programs were invited, and subsequently agreed, to co-sponsor (by covering

travel of additional invited speakers and/or convenors) the following Topic Sessions and workshops relevant to their scientific interests: “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*” (ICES), “*Ecosystem responses to multiple stressors in the North Pacific*” (SOLAS), “*Challenges in understanding North Hemisphere climate variability and change*” (CLIVAR and ICES), “*Changing ocean biogeochemistry and its ecosystem impacts*” (ICES, IMBER and SOLAS), “*Arctic – sub-Arctic interactions*” (ESSAS), and “*Global patterns of phytoplankton dynamics in coastal ecosystems*” (SCOR). Three events were organized jointly with Japanese agencies/societies: Topic Sessions on “*Environmental contaminants in marine ecosystems: Seabirds and marine mammals as sentinels of ecosystem health*” (JSPS) and “*Effects of natural and artificial calamities on marine ecosystems and the scheme for their mitigation*” (JSFO and FRA), and a workshop on “*Recruitment of juvenile Japanese eel (*Anguilla japonica*) in eastern Asia*” (FRA).

III. Providing secretarial services to inter-sessional symposia/sessions/workshops/meetings

Through the organization of scientific meetings, PICES aims to facilitate exchange of ideas and information, and to develop international collaborations across disciplines, national boundaries and institutions.

- In 2012, logistical and financial arrangements were made for 18 inter-sessional events (symposia, sessions, workshops and meetings) convened at various locations around the North Pacific and the world-at-large (see *Appendix 2* for the complete list). The landmark events of the year were the [2nd PICES/ICES Conference for Early Career Scientists \(ECS\) on “Oceans of change”](#) (April 24–27, 2012, Majorca, Spain), and the [2nd International Symposium on “Effects of climate change on the world’s oceans”](#) (May 13–20, 2012, Yeosu, Korea). The ECS conference provided an opportunity to foster a networking of future generations of ocean scientists working on the Northern Hemisphere early in their career. Only the second in what is anticipated to be a series of PICES/ICES ECS conferences, it was a tremendous success, with presentations from 130 participants selected from 550 applicants (see the [article](#) in PICES Press for details). The Symposium was the first academic event organized in conjunction with Ocean Expo-2012, and was attended by almost 330 scientists from 31 countries. The summary of the symposium and brief reports on all convened workshops are now published in the [July 2012 issue of PICES Press](#).
- Preparations, arrangements or planning are in progress for several symposia/meetings to be convened in 2013–2014. This includes events such as the PICES/ICES workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*” (May 2013, western Russia); PICES Summer School on “*Ocean observing systems*” (August 2013, Newport, U.S.A.) and FUTURE Open Science Meeting (April 2014, Hawaii, U.S.A.).

IV. Coordinating the publication program of the Organization

PICES publications are a record of the activities and scientific findings of the Organization. A dynamic and balanced publications program is needed for efficient communication with a highly varied audience.

- Publications produced after PICES-2011 included: 3 special issues of primary journals (work is also in progress for 3 more special issues to be published in 2013), 3 reports in the PICES Scientific Report Series (editing is in progress for 3 more reports to be published in spring 2013), several special and outreach publications, 2 issues of PICES Press, *etc.* (see *Appendix 3* for the complete list). Outreach publications are a new important part of the publication program of PICES.
- Further progress was made in the implementation of the Action Plan resulting from the 2008 PICES Publications Review:
 - A License Agreement was negotiated on the inclusion of PICES publications in the [EBSCO Publishing database](#), the most-used, premium online information resources for libraries and other institutions. Last year, the License Agreement was signed with the [ProQuest Science Journals database](#).
 - All new PICES publications were added to the IAMSILIC (International Association of Aquatic and Marine Science Libraries and Information Centers) [digital repository “Aquatic Commons”](#), to ensure that there is a complete collection at this source.

V. Intensifying the cooperation with other organizations/programs

As many of the scientific and capacity building issues addressed by PICES are not unique to the North Pacific, it is crucial to expand cooperation with other international scientific organizations and programs of regional

and global scale. Progress made in the integration and coordination of PICES' activities with some of these organizations/programs is reflected in *Appendix 4*.

- Thirty-four international and regional organizations and programs (see *GC Endnote 5* for the complete list) accepted the invitation to be present as observers at PICES-2012 (compare this number with 28 in 2011, 32 in 2010, 30 in 2009, and 21 in 2008), and expressed their views on potential areas of collaboration with PICES, including specific proposals for 2013 and beyond, at the meetings of Science Board, Standing Committees and/or their subsidiary bodies. Several organizations and programs had posters on display highlighting their objectives and recent activities.
- In 2012, PICES was represented (by officers or chairmen/members of committees and expert groups) as an observer at the meetings of international organizations/programs such as CLIVAR, ICES, IMBER, IOC-UNESCO, IODE, ISC and NOWPAP (see *GC Agenda Item 5* for details). The Executive Secretary participated in the 45th session of the IOC-UNESCO Executive Council (June 24–30, 2012, Paris, France) and, as a member of the International Review Committee, in the [Yeosu Declaration Forum and Roundtable](#) (August 12, 2012, Yeosu, Korea).
- The holding of co-sponsored symposia/sessions/workshops/training courses and the creation of joint expert groups were chosen as directions of actual collaboration:
 - In 2012, 4 international symposia, 11 topic sessions, 4 workshops, and several capacity building events were organized in partnership with other organizations and programs (see *Appendix 1* and *2* for details);
 - After amendments to the [PICES Rules of Procedure](#) were approved to allow experts from outside of PICES to serve as *ex-officio* members on PICES Technical Committees and subsidiary bodies of PICES Scientific Committees, several organizations requested this status. In 2012, representatives of NOWPAP nominated *ex-officio* members to serve on the Working Group on *Non-indigenous Aquatic Species* and Study Group on *Marine Pollutants*.
 - The only active joint expert group is the PICES/ICES Section (Strategic Initiative) on *Climate Change Effects on Marine Ecosystems* (the expected life is 2011–2020).
 - PICES currently supports associated members for two SCOR Working Groups: WG 137 on *Patterns of Phytoplankton Dynamics in Coastal Ecosystems: Comparative Analysis of Time Series Observation* (Dr. Sinjae Yoo, Korea) and WG 140 on *Biogeochemical Exchange Processes at the Sea-Ice Interfaces* (Dr. Lisa Miller, Canada).

VI. Administrating the Secretariat

- To increase the capacity of the Secretariat, a funding of ~\$39,000 was secured to support a part-time contract position at the PICES Secretariat. This amount includes a contribution from the Korea Ocean Research and Development Institute (specifically for assisting the Science Board Chairman) and an overhead for the PICES/MAFF project on “*Marine ecosystem health and human well-being*”.
- The PICES Intern Program has been a useful mechanism not only for the professional development of marine scientists and managers from PICES Contracting Parties, but also for increasing the capacity of the PICES Secretariat to support the work of the Organization. From May 2000 to December 2012, 13 scientists and managers from three member countries (5 from China, 5 from Korea and 3 from Russia) have worked as interns at the PICES Secretariat. Over the years the Intern Program has been financed solely by voluntary contributions. In 2012, the U.S. National Marine Fisheries Service and Fisheries and Oceans Canada contributed \$20,000 US and \$10,000 CAD, respectively, to the Trust Fund for the Program. With these contributions, the amount of funds kept for the Intern Program should be sufficient to maintain the Program in 2013. Details can be found under *GC Agenda Item 11*.
- The Executive Secretary has served as the co-coordinator (with Dr. Sonia Batten, SAHFOS) of a funding consortium to support the North Pacific Continuous Plankton Recorder (NP CPR) survey, and was responsible for the funding management and reporting for two PICES projects supported by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, the project on “*Development of the prevention systems for harmful organisms' expansion in the Pacific Rim*” (2007–2012) and the project on “*Marine ecosystem health and human well-being*” (2012–2017). The Deputy Executive Secretary has served as a member of the Scientific Project Team for the second PICES/MAFF project.

Appendix 1: Scientific sessions, workshops and business meetings convened at PICES-2012

Sessions

- ¾-day Science Board Symposium on “*Effects of natural and anthropogenic stressors in the North Pacific ecosystems: Scientific challenges and possible solutions*”;
- 1-day BIO Contributed Paper Session;
- 1-day BIO/FIS Topic Session on “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*” (co-sponsored by ICES);
- ½-day BIO/FIS/POC Topic Session on “*Advances in understanding the North Pacific Subtropical Frontal Zone ecosystem*”;
- ½-day BIO/MEQ Topic Session on “*Environmental contaminants in marine ecosystems: Seabirds and marine mammals as sentinels of ecosystem health*” (co-sponsored by JSPS);
- ½-day BIO/MEQ/FUTURE Topic Session on “*Ecosystem responses to multiple stressors in the North Pacific*” (co-sponsored by SOLAS);
- 1-day FIS Contributed Paper Session;
- ½-day FIS/MEQ Topic Session on “*Ecological functions and services associated with marine macrophyte communities as indicators of natural and anthropogenic stressors in nearshore zones of the North Pacific*”;
- ½-day FIS/MONITOR/POC Topic Session on “*Monitoring on a small budget: Cooperative research and the use of commercial and recreational vessels as sampling platforms for biological and oceanographic monitoring*”;
- ½-day MEQ Topic Session on “*Range extension, toxicity and phylogeny of epiphytic dinoflagellates*”;
- 1-day MEQ/FUTURE Topic Session on “*Social-ecological systems on walleye pollock and other commercial gadids under changing environment: An inter-disciplinary approach*”;
- ½-day MEQ/FUTURE Topic Session on “*Risk management in coastal zone ecosystems around the North Pacific*”;
- 1-day MONITOR/POC Topic Session on “*Effects of natural and artificial calamities on marine ecosystems and the scheme for their mitigation*” (co-sponsored by JSFO and FRA);
- 1-day POC Contributed Paper Session;
- 1-day POC Topic Session on “*Challenges in understanding North Hemisphere climate variability and change*” (co-sponsored by CLIVAR and ICES);
- ½-day POC/FIS Topic Session on “*Linking migratory fish behavior to end-to-end models II*”;
- 1-day POC/TCODE Topic Session on “*Changing ocean biogeochemistry and its ecosystem impacts*” (co-sponsored by ICES, IMBER and SOLAS).

Workshops

- 1-day BIO Workshop on “*Identifying critical multiple stressors of North Pacific marine ecosystems and indicators to assess their impacts*”;
- 1-day BIO Workshop on “*Secondary production: Measurement methodology and its application on natural zooplankton community*”;
- 1-day BIO Workshop on “*The feasibility of updating prey consumption by marine birds, marine mammals, and large predatory fish in the PICES regions*”;
- 2-day BIO Workshop on “*Comparison of multiple ecosystem models in several North Pacific shelf ecosystems (MEMIP-IV)*”;
- 1-day FIS Workshop on “*Recruitment of juvenile Japanese eel (*Anguilla japonica*) in eastern Asia*” (co-sponsored by FRA);
- 1½-day MEQ Workshop on “*The contrasting cases of harmful algal blooms in the eastern and western Pacific in 2007 and 2011*”;
- 1-day ESSAS/PICES Workshop on “*Arctic–sub-Arctic interactions*”;
- 2-day SCOR/PICES Workshop on “*Global patterns of phytoplankton dynamics in coastal ecosystems*”.

Business meetings

- ¼-day Science Board (SB) meeting (October 14) and 1½-day SB meeting (October 19 p.m. and October 20);
- 1½-hour overture meetings (October 14 evening) and ½-day meetings of Scientific and Technical Committees (October 17 p.m.);
- 1-day meeting of the SB Section on *Human Dimensions of Marine Systems*;

- 1-day meeting of the BIO/FIS/POC Section on *Climate Change Effects on Marine Ecosystems*;
- 1-day meeting of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific*;
- ½-day meeting of the POC/BIO Section on *Carbon and Climate*;
- 1-day meeting of the MEQ Working Group on *Non-indigenous Aquatic Species*;
- ½-day meeting of the FIS/MEQ Working Group on *Environmental Interactions of Marine Aquaculture*;
- ½-day meeting the BIO Working Group on *Jellyfish Blooms around the North Pacific Rim*;
- ½-day meeting of the POC Working Group on *North Pacific Climate Variability and Change*;
- 1-day meeting of the MEQ/BIO Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors*;
- 1-day meeting of the POC Working Group on *Regional Climate Modeling*;
- 1-day meeting of the BIO Advisory Panel on *Marine Birds and Mammals*;
- ½-day meeting of the POC/MONITOR Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas*;
- ¼-day meeting of the MONITOR Advisory Panel on the *Continuous Plankton Recorder Survey in the North Pacific*;
- 1-day meeting of the MEQ Study Group on *Marine Pollutants*;
- ½-day concurrent meetings of the FUTURE Advisory Panels on *Anthropogenic Influences on Coastal Ecosystems, Climate, Oceanographic Variability and Ecosystems* and *Status, Outlooks, Forecasts, and Engagement*, preceded by ½-day joint meeting of these Panels.

Appendix 2: Inter-sessional symposia/workshops/meetings organized/sponsored after PICES-2011

Symposia

- [2nd PICES/ICES/IOC International Symposium on “Effects of climate change on the world’s oceans”](#) (May 13–20, 2012, Yeosu, Korea), with Hiroaki Saito (Japan) serving as a PICES co-convenor and Alexander Bychkov (PICES Secretariat) serving as a symposium coordinator. The symposium included 10 Theme Sessions and 7 workshops. The summary of the symposium and brief reports on all convened workshops are now published in the [July 2012 issue of PICES Press](#).
- GEOHAB Open Science Meeting on [“Progress in interpreting life history and growth dynamics of harmful algal blooms in fjords and coastal environments”](#), co-sponsored by PICES (May 29–31, 2012, Victoria, Canada);
- [15th International Conference on Harmful Algae](#), co-sponsored by PICES (October 29–November 2, 2012, Changwon, Korea);
- [ICES/PICES Symposium on “Forage fish interactions: Creating the tools for ecosystem based management of marine resources”](#) (November 8–12, 2012, Nantes, France), with Vladimir Radchenko (Russia) serving as a PICES symposium co-convenor, and Akinori Takasuka (Japan) serving as a PICES keynote speaker (see the [article](#) in PICES Press for details).

Joint Theme Sessions at the 2012 ICES Annual Science Conference (September 17–21, 2012, Bergen, Norway)

- Session A on *“Understanding, measuring and projecting the limits of resilience in marine ecosystems”*, with Sinjae Yoo (Korea) and Skip McKinnell (PICES Secretariat) serving as PICES co-convenors;
- Session I on *“Multidisciplinary perspectives in the use (and misuse) of science and scientific advice in Marine Spatial Planning”*, with Thomas Therriault (Canada) serving as a PICES co-convenor;
- Session M on *“Subarctic-Arctic Interactions: Ecological consequences”*, with Anne Hollowed (U.S.A.) serving as a PICES co-convenor;
- Session Q on *“Sustainability of aquaculture”*, with Katsuyuki Abo (Japan) serving as a PICES co-convenor.

Other joint Theme Sessions

- CLIOTOP special session on *“Global science for global governance of oceanic ecosystems and fisheries”* at the Planet Under Pressure Conference, co-sponsored by PICES (March 26–29, 2012, London, UK), with Mitsutaku Makino (Japan) serving as a PICES invited speaker.

Workshops and meetings

- PICES/MAFF Project Synthesis Workshop (March 20–23, 2012, Newport, Oregon, U.S.A.);
- Workshop, led by PICES WG 29, on *“Climate change projections for marine ecosystems: Best practices, limitations and interpretations”* (May 13–14, 2012, Yeosu, Korea);

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- FUTURE Roadmap Workshop (May 22–24, 2012, Busan, Korea);
- Inter-sessional Science Board meeting (May 24–25, 2012, Busan, Korea);
- [GLOBEC/PICES/ICES Workshop, led by PICES WG 27, on “Forecasting ecosystem indicators with process-based models”](#) (September 7–11, 2012, Friday Harbor, WA, U.S.A.).

Capacity development events

- 3rd PICES/MAFF Workshop on “*Introduction to Rapid Assessment Survey methodologies for detecting non-indigenous marine species*”, co-sponsored by FRA, NOWPAP and WESTPAC (February 8–9, 2012, Nagasaki, Japan);
- PICES/MAFF training course on screening methods for testing shellfish for paralytic shellfish poisoning toxins and phytoplankton identification (February 17–22 (Jakarta) and February 23–24 (Lombok Island), 2012, Indonesia);
- [2nd PICES/ICES Conference for Early Career Scientists \(ECS\) on “Oceans of change”](#) (April 24–27, 2012, Majorca, Spain);
- [IMBER-led international ClimECO3 Summer School](#) on “*A view towards Earth System models: Human-natural system interactions in the marine world*”, co-sponsored by PICES (July 23–28, Ankara, Turkey).

Appendix 3: PICES publications in 2012 and beyond

Primary journals

- Special issue based on selected papers from the 2011 Zooplankton Production Symposium on “*Population connections, community dynamics, and climate variability*” (Guest Editors: J. Keister, D. Bonnet, S. Chiba, C. Johnson and D. Mackas) in *ICES Journal of Marine Science*, Vol. 69, No. 3, pp. 347–492 (May 2012);
- Special issue based on selected papers from the PICES-2010 Topic Session on “*Economic relation between marine aquaculture and wild capture fisheries*” (Guest Editors: M. Pang and P. Leung) in *Aquaculture Economics and Management*, Vol. 16, No. 2, pp. 98–181 (April-June 2012);
- Special issue (dedicated to Dr. Bernard Megrey) based on selected papers from the 2011 ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and subpolar ocean ecosystems: Progress in observations and predictions*” (Guest Editors: K. Drinkwater, G.L. Hunt, Jr., O. Astthórsson and E. Head) in *ICES Journal of Marine Science*, Vol. 69, No. 7, pp. 1119–1328 (September 2012);
- The following special issues are in progress and are expected to be submitted/published in 2013:
 - *ICES Journal of Marine Science* – special issue based on selected papers from the 2nd International Symposium on “*Effects of climate change on the world’s oceans*” (Editor: E. Anderson);
 - *Marine Ecology Progress Series* – special topic section based on selected papers from the PICES-2011 Topic Session on “*Mechanisms of physical-biological coupling forcing biological hotspots*” (Guest Editors: R. Suryan, J. Alheit, E. Hazen, O. Katugin, Y. Watanuki, I. Yasuda);
 - *Fisheries Science* – special issue based on selected papers from the 2012 Topic Session on “*Social-ecological systems on walleye Pollock and other commercial gadids under changing environment: Inter-disciplinary approach*” (Guest Editors: K. Criddle, S. Kim, M. Makino, I. Perry, Y. Sakurai and A. Velikanov);
 - *Progress in Oceanography* – special issue based on selected papers from the 2012 Topic Session on “*Advances in understanding the North Pacific Subtropical Frontal Zone ecosystem*” (Guest Editors: T. Ichii, S. McKinnell and M. Seki)
 - *Progress in Oceanography* – special issue on modeling marine ecosystem dynamics dedicated to Dr. Bernard Megrey (Guest Editors: E. Curchitser, G. Huse and S.I. Ito).

PICES Scientific Report series

- Makino, M. and Fluharty, D. (Eds.). Report of the Study Group on *Human Dimensions*, PICES Sci. Rep. No. 39, 40 pp. (published in December 2011);
- Foreman, M.G. and Yamanaka, Y. (Eds.). Report of Working Group 20 on *Evaluations of Climate Change Projections*, PICES Sci. Rep. No. 40, 165 pp. (published in December 2011);
- McKinnell, S. (Ed.). PICES Advisory Report to the Cohen Commission on “*The decline of Fraser River sockeye salmon in relation to marine ecology*”, PICES Sci. Rep. No. 41, 149 pp. (published in September 2012);
- The following reports are in progress and are expected to be submitted/published in spring 2013:

- Shaw, C.T. and Peterson, W. (Eds.). Report of the Working Group on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim*;
- Takeda, S. and Chai, F. (Eds.). Report of Working Group 22 on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean*;
- Hollowed, A. and Kim, S. (Eds.). Report of the Working Group on *Forecasting Climate Change Impacts on Fish and Shellfish*.

Other Publications

- Special publication based on selected peer-reviewed papers and a conference summary from the 26th Lowell Wakefield Symposium on *“Ecosystems 2010: Global Progress on Ecosystem-based Fisheries Management”* co-sponsored by [Alaska Sea Grant](#), [ICES](#), [FAO](#), PICES and [NOAA](#) (Guest Editors: G.H. Kruse, H.I. Browman, K.L. Cochrane, D. Evans, G.S. Jamieson, P.A. Livingston, D. Woodby and C.I. Zhang). 2012. *Global progress in ecosystem-based fisheries management*. Alaska Sea Grant, UAF. 396 pp. (published as a pdf only to be accessed at <http://seagrant.uaf.edu/bookstore/pubs/AK-SG-12-01.html>);
- Lee II, H. and Reusser, D. 2012. *Atlas of non-indigenous marine and estuarine species in the North Pacific* (published in pdf format only);
- Outreach brochures on harmful algal bloom and non-indigenous species components of the PICES/MAFF project on *“Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim”*;
- USB (for all PICES-2012 participants) with PICES Scientific Publications from 1993–2012.

E-Newsletter

- Two regular issues of PICES Press: Vol. 20, No. 1 (winter 2012) and Vol. 20, No. 2 (summer 2012).

Announcements/Posters/Books of Abstracts

- Book of Abstracts for the 2nd International Symposium on *“Effects of Climate Change on the world’s oceans”* (Yeosu, Korea);
- Announcement, poster and Book of Abstracts for PICES-2012 (Hiroshima, Japan);

Appendix 4: Relations with international scientific organizations and programs

Climate Variability and Predictability Program (CLIVAR)

The main area for cooperation between PICES and CLIVAR is the impact of climate variability and change on marine ecosystems.

- A Topic Session on *“Challenges in understanding North Hemisphere climate variability and change”* was convened at PICES-2012 and co-sponsored by CLIVAR and ICES;
- A joint CLIVAR/PICES Theme Session on *“Biophysical interactions”* will be held at the 2nd International Symposium on *“Boundary Current dynamics”* (July 8–13, 2013, Lijiang, China);
- Drs. Shoshiro Minobe (WG 27 Co-Chairman) and Hiroaki Saito (AP-COVE Chairman) represented PICES at the CLIVAR Pacific Implementation Panel meeting (April 29–May 1, 2012, Noumea, New Caledonia);
- Dr. Toshio Suga represented CLIVAR at PICES-2012;

Ecosystem Studies of Sub-Arctic Seas (ESSAS)

PICES and ESSAS (a regional program initiated by GLOBEC in 2005 and placed under IMBER in 2009) share the goal of using a comparative approach in developing predictions of how climate variability and change affect, and will affect, the sustainability of goods and services obtained from Sub-Arctic seas.

- PICES provided organizational support for the second ESSAS Open Science Meeting (OSM) on *“Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction”* (May 2011, Seattle, USA). Special issue of *ICES Journal of Marine Science* (dedicated to Dr. Bernard Megrey) based on selected papers from this OSM (Guest Editors: K. Drinkwater, G.L. Hunt, Jr., O. Astthórsson and E. Head) was published in September 2012 (Vol. 69, No. 7, pp. 1119–1328).
- The goal of the Marine Ecosystem Model Inter-comparison Project (MEMIP), initiated by PICES and ESSAS in 2008, is to compare the performance of various lower trophic level marine ecosystem simulation models in predicting the abundance and distribution of coastal zooplankton functional groups. A series of joint MEMIP workshops has been organized in conjunction with PICES Annual Meetings since 2008. A 2-day MEMIP workshop on *“Comparison of multiple ecosystem models in several North Pacific shelf ecosystems”* was held at PICES-2012.

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- A joint ESSAS/PICES workshop on “*Subarctic–Arctic interactions*” was convened at PICES-2012.
- ESSAS is normally present as an observer at PICES Annual Meetings. Drs. Kenneth Drinkwater and Franz Mueter (SSC Co-Chairmen) represented ESSAS at PICES-2012.

Exxon Valdez Oil Spill Trustee Council (EVOSTC)

EVOSTC is a member of the PICES funding consortium to support the North Pacific Continuous Plankton Recorder (NP CPR) survey.

- EVOSTC approved funding of \$188,600 US for operations of the NP CPR project in 2010–2012, and report writing in 2013 (project on “*Measuring inter-annual variability in the herring’s forage base from the Gulf of Alaska*”), with the amount of \$59,700 US for 2012.
- A new project on “*Long-term monitoring of zooplankton populations on the Alaskan Shelf and Gulf of Alaska using Continuous Plankton Recorders*”, with a similar level of funding from 2013–2016, was approved as a part of a Long Term Monitoring Program of EVOSTC.

Food and Agriculture Organization of UN (FAO)

The main area for cooperation between PICES and FAO is the impact of climate change on fish and fisheries.

- FAO joined PICES and ICES as major international sponsors for the International Symposium on “*Climate change effects on fish and fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies*” (April 25–29, 2010, Sendai, Japan).
- FAO co-sponsored the 2nd PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*” (May 13–20, 2012, Yeosu, Korea) by providing \$10,000 US to support scientists from developing countries and countries with economies in transition to attend the meeting.
- Dr. Yimin Ye represented FAO at PICES-2012.
- FAO experts will be involved in the PICES/ICES workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*” to be held May 22–24, 2013 in St. Petersburg, Russia.

Global Ecology and Oceanography of Harmful Algal Blooms Program (GEOHAB)

PICES communicates with various international HAB efforts, including IOC/SCOR GEOHAB Program, through the Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S).

- The basic plan has been jointly developed by PICES, ICES and GEOHAB to explore HAB and climate change linkages. It is a two-phase approach, with a Phase I workshop (10–12 persons) to be held in March 2013, to: (1) assess the state of knowledge on HABs and climate change, and (2) identify the most critical research needs that can realistically be addressed over the next 5–10 years. The output would be a review (concept) paper targeted for a high-level scientific journal. In Phase II, the broad topic areas identified by the workshop participants will serve as the foundation for sessions in an Open Science Meeting to be convened in 2014 or 2015.

Group of Experts on Scientific Aspects of Marine Pollution (GESAMP)

The main area for cooperation between PICES and GESAMP is pollution indicators for assessments of regional and global environmental concerns.

- GESAMP co-sponsored, by supporting an additional invited speaker/convenor, a workshop on “*Pollutants in a changing ocean: Refining indicator approaches in support of coastal management*” at PICES-2011. This workshop led to the formation of a 1-year PICES Study Group on *Marine Pollutants* (SG-MP) in order to (1) identify novel or promising approaches to operational marine pollution assessment in PICES member countries and (2) develop recommendations for a possible expert group on marine pollutants. Dr. Peter Kershaw (GESAMP Vice-Chairman), attended the SG-MP meeting at PICES-2012. It is expected that input from GESAMP will increase efficiencies and the scientific value of the SG-MP outcome.

Integrated Marine Biogeochemistry and Eco-system Research (IMBER)

Issues in marine biogeochemistry and food webs are important components of the integrative science program of PICES, FUTURE.

- PICES and IMBER have convened joint topic sessions at every PICES Annual Meeting since 2008, and IMBER has provided travel funds for an additional invited speaker for each of these sessions. The following sessions were organized in 2011–2012:
 - “*How well do our models really work and what data do we need to check and improve them?*” (PICES-2011, Khabarovsk, Russia);
 - “*Changing ocean biogeochemistry and its ecosystem impacts*” (PICES-2012, Hiroshima, Japan).
 IMBER was invited and agreed to co-sponsor a topic session on “*Marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being*” at PICES-2013.
- PICES co-sponsored the CLIOTOP (IMBER Regional Program on CLimate Impacts on Oceanic TOp Predators) special session on “*Global science for global governance of oceanic ecosystems and fisheries*” at the Planet Under Pressure Conference (March 26–29, 2012, London, UK), by providing travel support for an invited speaker from the North Pacific.
- IMBER co-sponsored the 2nd PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*” (May 13–20, 2012, Yeosu, Korea) by providing partial travel support for 2 speakers for the workshop on “*Effects of climate change on advective fluxes in high latitude regions*”.
- PICES co-sponsored IMBER IMBIZO II on “[*Integrating biogeochemistry and ecosystems in a changing ocean: Regional comparisons*](#)” (October 10–14, 2010, Crete, Greece) by providing travel support for 3 invited speakers from the North Pacific and agreed to co-sponsor IMBER IMBIZO III on “*Multi-dimensional approaches to the challenges of global change in continental margins and open ocean systems*” (January 28–31, 2013, Goa, India) at the same level.
- PICES co-sponsored the IMBER ClimECO3 Summer School on “*A view towards Earth System models: Human-natural system interactions in the marine world*” (July 23–28, 2012, Ankara, Turkey) by providing travel funds and arranging additional support (through national programs/agencies) for 5 early career scientists from PICES member countries (1 from Japan, 2 from Korea and 2 from China).
- IMBER was invited and agreed to co-sponsor the 2013 PICES Summer School on “*Ocean observing systems and ecosystem monitoring*” (August 2013, Newport, Oregon, USA).
- In 2011, new expert groups on human dimensions were established by IMBER (Working Group on *Human Dimensions (WG-HD)*); and PICES (Section on *Human Dimensions (S-HD)*). These two expert groups have the same motivations, similar objectives, identical challenges, and overlapping membership (Drs. Mitsutaku Makino and Ian Perry are members of both groups) and are well set to work together to more effectively implement their tasks.
- IMBER is normally present as an observer at PICES Annual Meetings. Dr. Kenneth Drinkwater (IMBER SSC member) represented IMBER at PICES-2012.

Intergovernmental Oceanographic Commission of UNESCO (IOC)

Main topics for cooperation between PICES and IOC are: (i) the impact of climate variability and change on marine ecosystems; (ii) monitoring (through GOOS); (iii) harmful algal blooms (through IPHAB and GEOHAB); and (iv) CO₂ data integration and synthesis (through IOCCP).

- IOC and PICES worked together (with ICES as another major international sponsor) to organize the 2nd International Symposium on “*Effects of climate change on the world’s oceans*” (May 13–20, 2012, Yeosu, Korea). Planning is initiated for the 3rd symposium in this series to be held in the spring of 2015, in Brazil.
- GOOS co-sponsored the workshop to discuss the Framework for Ocean Observing (FOO) held in conjunction with the above mentioned PICES/ICES/IOC Symposium. [The report of the workshop](#) can be found in the July 2012 issue of PICES Press.
- In June 2005, PICES joined the IOC-led **Harmful Algal Event DAT**abase (HAE-DAT), a partnership in systematically compiling, storing, and presenting on-line records on harmful algal events. Building a common data resource allows inter-comparison of HAB species composition and the magnitude of their environmental and economic impacts. Discussion on this joint project proceeds at each PICES Annual Meeting.
- Information on the basic plan jointly developed by PICES, ICES, SCOR and IOC to explore HAB and climate change linkages can be found under GEOHAB.
- ICES and PICES continue to regularly exchange observers at each others’ annual meetings. Dr. Yutaka Michida (IOC Vice-Chairman) represented IOC at PICES-2012.

International Council for the Exploration of the Sea (ICES)

The two major international marine science organizations in the Northern Hemisphere, ICES and PICES, are focused on different oceans but have many scientific issues in common. The PICES/ICES framework for scientific cooperation was endorsed by both organizations in 2011. The report of the joint Study Group on *Developing a Framework for Scientific Cooperation in Northern Hemisphere Marine Science* identified the following research foci that are currently, or soon to become, areas of joint interest: (1) climate change, (2) ecosystem assessment, (3) marine spatial planning, and (4) ocean acidification and hypoxia/anoxia. A desire was also expressed by both organizations to foster and enhance collaboration in operational areas such as training, knowledge exchange, and communication. Under the proposed framework, cooperation can take the form of co-sponsored symposia, workshops, or topic sessions at each other's annual meetings; expert groups and strategic initiatives where PICES and ICES appoint scientists to focus on topics of joint interest, joint publications, joint training initiatives, joint advice, *etc.*

- PICES and ICES worked together to organize the 2nd ICES/PICES Conference for Early Career Scientists on “*Oceans of change*” (April 24–27, 2012, Majorca, Spain), 2nd International Symposium on “*Effects of climate change on the world's oceans*” (May 13–20, 2012, Yeosu, Korea) and International Symposium on “*Forage fish interactions: Creating the tools for ecosystem based management of marine resources*” (November 8–12, 2012, Nantes, France).
- Four joint Theme Sessions were convened at the 2012 ICES Annual Science Conference (September 17–21, 2012, Bergen, Norway):
 - Session A on “*Understanding, measuring and projecting the limits of resilience in marine ecosystems*”;
 - Session I on “*Multidisciplinary perspectives in the use (and misuse) of science and scientific advice in Marine Spatial Planning*”;
 - Session M on “*Subarctic-Arctic Interactions: Ecological consequences*”;
 - Session Q on “*Sustainability of aquaculture*”.

Four joint Theme Sessions will be convened at the 2013 ICES Annual Science Conference (September 23–27, 2013, Reykjavik, Iceland):

- Session A on “*Marine litter*”;
- Session B on “*Responses of living marine resources to climate change and variability: Learning from the past and projecting the future*”;
- Session E on “*Do food web dynamics matter in fisheries management?*”;
- Session M on “*Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and "data dreams" for the future*”.
- Three joint Topic Sessions were convened at PICES-2012:
 - Session 3 on “*Challenges in understanding North Hemisphere climate variability and change*” (also with CLIVAR);
 - Session 7 on “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*”;
 - Session 14 on “*Changing ocean biogeochemistry and its ecosystem impacts*” (also with IMBER and SOLAS).

Two joint workshops will be convened at PICES-2013:

- Workshop 1 on “*Comparison of size-based and species based ecosystem models*”
- Workshop 2 on “*Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and "data dreams" for the future*”
- A GLOBEC/PICES/ICES workshop on “*Forecasting ecosystem indicators with process-based models*”, was held September 7–11, 2012, in Friday Harbor, WA, U.S.A. The goal of this workshop was to identify and model key processes that enable us to succinctly and quantifiably explain the mechanisms underlying the correlative relationships in physical-biological datasets, both in the North Pacific and North Atlantic. A follow-up workshop on “*Identifying mechanisms linking physical climate and ecosystem change*” is planned for PICES-2013.
- In 2011, PICES and ICES established a joint Section (Strategic Initiative) on *Climate Change Effects on Marine Ecosystems*. This group met three times in 2012: in conjunction with the 2nd International Symposium on “*Effects of climate change on the world's oceans*” in May 2012 (Yeosu, Korea), at the 2012 ICES Annual Science Conference in September (Bergen, Norway), and at PICES-2012 in October.

Proposals have been submitted for the following joint events: (1) an inter-sessional workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*” to be held in May 2013, in Russia, (2) a Theme Session on “*Climate-induced shifts in spatial distributions*” to be convened at the 2013 ICES Annual Science Conference in Reykjavik, Iceland; and (3) a workshop on “*Comparison of size-based and species based ecosystem models*” to be convened at PICES-2013 in Nanaimo, Canada.

- Dr. Mark Wells (member of the Section on *Ecology of Harmful Algal Blooms in the North Pacific*) represented PICES at the meeting of ICES-IOC Working Group on Harmful Algal Bloom Dynamics (April 24–27, Oban, UK). Information on the basic plan for “*HAB and climate change events*” developed at this meeting can be found under GEOHAB.
- Two special issues of *ICES Journal of Marine Science* (IJMS) were published based on papers presented at joint symposia: the 5th PICES/ICES Zooplankton Production Symposium on “*Zooplankton population connections, community dynamics, and climate variability*” (May 2012, [Vol. 69, No. 3, pp. 347–492](#)) and the 2011 ESSAS Open Science Meeting on “*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: Progress in observation and prediction*” (September 2012, Vol. 69, No. 7, pp. 1119–1328).
- ICES and PICES continue to regularly exchange observers at each others’ annual meetings.
 - Drs. Skip McKinnell (PICES Deputy Executive Secretary) and Thomas Therriault (Science Board Vice-Chairman) represented PICES at the 2012 SCICOM meeting held in conjunction with the ICES Annual Science Conference in Bergen, Norway.
 - Drs. Anne Christine Brusendorff (ICES General Secretary) and Adolf Kellermann (Head of ICES Science Programme) represented ICES at PICES-2012.

North Pacific Anadromous Fish Commission (NPAFC)

In 1998, NPAFC and PICES signed a Memorandum of Understanding (MOU), and scientists involved in the two organizations have been working together on problems of mutual interest for 15 years, with a good record of joint activities.

- NPAFC co-sponsored the PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*” (May 13–20, 2012, Yeosu, Korea).
- NPAFC and PICES continue to regularly exchange observers at each others’ annual meetings. Dr. Shigehiko Urawa (Science Sub-Committee Chairman) represented NPAFC at PICES-2012.
- At PICES-2012, PICES and NPAFC agreed to establish a joint Study Group on *Scientific Cooperation in the North Pacific Ocean*, which over approximately one year, will develop a framework of enhanced collaboration between the two organizations to achieve better and/or more rapid understanding of natural and anthropogenic variability in marine ecosystems. The study group will review each organization’s scientific needs and identify where similar key questions or scientific issues might be explored jointly.

North Pacific Research Board (NPRB)

- NPRB joined the PICES funding consortium to support the North Pacific Continuous Plankton Recorder (NP-CPR) survey in 2009, and committed \$50,000 US per year for 5 years (until May 31, 2014) to support operations of the NP CPR project.
- NPRB regularly co-sponsor symposia and capacity building events organized by PICES. This year, \$5,000 US was provided for the 2nd ICES/PICES Conference for Early Career Scientist on “*Oceans of change*” (April 24–27, 2012, Majorca, Spain), and a grant of \$15,000 US for the 2nd PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*” (May 13–20, 2012, Yeosu, Korea).
- NPRB was invited to co-sponsor the 2013 PICES Summer School on “*Ocean observing systems and ecosystem monitoring*” (August 2013, Newport, Oregon, USA).
- NPRB is normally represented as an observer at PICES Annual Meetings. Dr. Francis Wiese (Science Director) represented NPRB at PICES-2012.

Northwest Pacific Action Plan (NOWPAP)

NOWPAP’s focus on monitoring and assessment of environmental (anthropogenic) problems combined with the broad scientific mandate of PICES provides the two organizations with great potential for cooperation. Currently, the main contacts and joint activities are on capacity building and various MEQ-related issues, including harmful algal blooms and invasive species and other stressors in coastal zone ecosystems.

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- NOWPAP was the very first international organization that requested the *ex-officio* membership in PICES—Dr. Takafumi Yoshida (CEARAC, Japan) was appointed as an *ex-officio* member of the PICES Section on *Ecology of Harmful Algal Blooms in the North Pacific*. In 2012, a representation of NOWPAP on two more expert groups were endorsed by Science Board and approved by Council: Dr. Sangjin Lee (NOWPAP Scientific Affairs Officer) will serve as an *ex-officio* member on WG on *Non-indigenous Aquatic Species* (WG 21), and Dr. Vladimir Shulkin (Russia, NOWPAP POMRAC) on Study Group on *Marine Pollutants* (SG-MP).
- After a success of the 2011 NOWPAP/PICES/WESTPAC training course on “*Remote sensing data analysis*” (October 8–12, 2011, Vladivostok, Russia), PICES was invited and agreed to join NOWPAP in organizing a follow-up course on the same topic to be held in fall 2013, in Qingdao, China. The level of technical and financial support from PICES will be decided in joint consultations.
- A PICES/NOWPAP/WESTPAC workshop on “*Introduction to rapid assessment survey (RAS) methodologies for detecting non-indigenous marine species*”, with a main objective to educate participants in RAS methodologies and demonstrate their application (15 trainees from China, Indonesia, Japan, Korea, the Philippines, Thailand and Vietnam), was held February 8–9, 2012, in Nagasaki, Japan. The outcomes from the NOWPAP regional workshop on “*Marine invasive species (MIS) problems in the Northwest Pacific*” (October 23–24, 2012, in Qingdao, China) will be included in the final report of PICES WG 21.
- NOWPAP is normally represented as an observer at PICES Annual Meetings. Drs. Alexander Tkalin (Coordinator) and Sangjin Lee (Scientific Affairs Officer) represented NOWPAP at PICES-2012.

Scientific Committee on Oceanic Research (SCOR)

SCOR and PICES have worked out ways of cooperation that have made it possible for an international non-governmental organization and a regional intergovernmental organization to share their strengths. Continuing and expanding collaboration between the two organizations is based on the recognition that PICES can play an important role in bringing a North Pacific perspective to the global activities of SCOR, and that by participating in and implementing these activities in the region, PICES can advance its own scientific agenda. PICES contributes to SCOR-sponsored international large-scale ocean research projects (see GEOHAB, IMBER, SOLAS), to ocean carbon activities supported by SCOR, and to several SCOR Working Groups.

- PICES supports associated members for two current SCOR Working Groups:
 - WG 137 on *Patterns of Phytoplankton Dynamics in Coastal Ecosystems: Comparative Analysis of Time Series Observation* (Dr. Sinjae Yoo, Korea);
 - WG 140 on *Biogeochemical Exchange Processes at the Sea-Ice Interfaces* (Dr. Lisa Miller, Canada).
- A 2-day SCOR/PICES workshop on “*Global patterns of phytoplankton dynamics in coastal ecosystems*” and a 1-day SCOR WG 137 meeting were held in conjunction with PICES-2012. PICES covered meeting costs and travel expenses for the workshop invited speaker, and SCOR covered the registration fee for all WG members who attended PICES-2012.
- SCOR continues to provide travel support for scientists from countries with “economies in transition” to participate in SCOR-relevant sessions/workshops at PICES Annual Meetings and international symposia led/co-organized by PICES. In 2012, US\$5,000 from the SCOR/NSF fund was provided to each of the following two events:
 - 2nd PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*” (May 13–20, 2012, Yeosu, Korea);
 - PICES-2012 (October 12–21, 2012, Hiroshima, Japan).
- PICES appointed a liaison, Dr. George Boehlert (U.S. national delegate), to the SCOR Committee on Capacity Building, who attended the SCOR-led conference on “*Developing a global strategy for capacity building in the ocean sciences*” (August 16–18, 2010, Bremen, Germany) and the 2011 meeting of the SCOR Committee on Capacity Building (April 19–21, 2011, Izmir, Turkey). Dr. Harold Batchelder, the new U.S. national delegate, serves in this capacity from September 2012.
- SCOR and PICES continue to regularly exchange observers at each others’ annual meetings. Dr. Satoru Taguchi (SCOR Vice-Chairman) represented SCOR at PICES-2012.

Surface Ocean-Lower Atmosphere Study (SOLAS)

The main areas for cooperation between PICES and SOLAS include: the impact of iron on biogeochemistry and marine ecosystems; and carbon cycle research studies.

- PICES and SOLAS have convened joint topic sessions and workshops at PICES Annual Meeting since 2006, and SOLAS has provided travel funds for an additional invited speaker/convenor for each of these events. The following joint sessions are to be organized at PICES-2012:
 - Session on “*Ecosystem responses to multiple stressors in the North Pacific*”;
 - Session on “*Changing ocean biogeochemistry and its ecosystem impacts*”.
 SOLAS was invited and agreed to co-sponsor a topic session on “*The changing carbon cycle of North Pacific continental shelves and marginal seas*” at PICES-2013 (October 11–20, 2013, Nanaimo, Canada).
- PICES co-sponsored the 5th SOLAS Summer School (August 29–September 10, 2011, Cargèse, Corsica, France) by providing travel funds for 3 students/early career scientists from PICES member countries (Canada, China and USA), and agreed to support the 6th SOLAS summer school (August 23–September 2, 2013, Xiamen, China) at the same level.
- SOLAS was invited and agreed to co-sponsor the 2013 PICES Summer School on “*Ocean observing systems and ecosystem monitoring*” (August 2013, Newport, Oregon, USA).
- The SOLAS/IMBER Carbon (SIC) Research Working Group is charged with coordination and synthesis of ocean carbon research. PICES, through its Working Groups on *CO₂ in the North Pacific* (WG 13; 1998–2001) and *Biogeochemical Data Integration and Synthesis* (WG 17; 2002–2005), and now through the Section on *Carbon and Climate* (S-CC; 2006–present;), has been long acting as a regional coordinator for these activities. S-CC provides a channel of communication to SIC-WG. There are S-CC members on each of SIC’s subgroups: Dr. Toshiro Saino serves on the subgroup 1 on *Surface Ocean System*, Dr. Masao Ishii is on the subgroup 2 on *Interior Ocean Carbon*, and Drs. Richard Feely and Minhan Dai are members of the subgroup 3 on *Ocean Acidification*.
- SOLAS is normally present as an observer at PICES Annual Meetings. Drs. Lisa Miller and Yukihiro Nojiri (SSC members) represented SOLAS at PICES-2012.

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List of organizations and programs present as observers at PICES-2012

Alaska Ocean Observing System (AOOS)	Dr. Phillip Mundy
Arctic Monitoring and Assessment Program (AMAP)	Dr. Kenneth Drinkwater
Asia-Pacific Fisheries Commission (APFIC)	Dr. Yimin Ye
Asia Pacific Network for Global Change Research (APN)	Mr. Xiaojun Deng
Bering Sea Ecosystem Study (BEST-BSIERP)	Dr. Francis Wiese
Central and Northern California Ocean Observing System (CeNCOOS)	Dr. Steven Bograd
Climate Variability and Predictability Program (CLIVAR)	Dr. Toshio Suga
Coordinating Body on the Seas of East Asia (COBSEA)	Dr. Ellik Adler
Ecosystem Study of Sub-Arctic Seas (ESSAS)	Dr. Kenneth Drinkwater
	Dr. Franz Mueter
Food and Agriculture Organization (FAO)	Dr. Yimin Ye
Group of Experts on Scientific Aspects of Marine Pollution (GESAMP)	Dr. Peter Kershaw
Global Ocean Observing System (GOOS)	Dr. Yutaka Michida
Integrated Marine Biogeochemistry and Ecosystem Research (IMBER)	Dr. Kenneth Drinkwater
Intergovernmental Oceanographic Commission (IOC) of UNESCO	Dr. Yutaka Michida
IOC Sub Committee for the Western Pacific (WESTPAC)	Dr. Yutaka Michida
International Council for the Exploration of the Sea (ICES)	Dr. Anne Christine Brusendorff
	Dr. Adolf Kellermann
International Ocean Carbon Coordinated Project (IOCCP)	Dr. Masao Ishii
	Mr. Alexander Kozyr
International Oceanographic Data and Information Exchange (IODE)	Mr. Ward Appeltans (via webex)
International Program for Deployment of Profiling Floats (Argo)	Dr. Toshio Suga
International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC)	Dr. Hideki Nakano
	Dr. Francisco Werner

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International Whaling Commission (IWC)	Dr. Hidehiro Kato
North East Asian Regional GOOS (NEAR-GOOS)	Dr. Hee-Dong Jeong
North Pacific Anadromous Fish Commission (NPAFC)	Dr. Shigehiko Urawa
North Pacific Fishery Management Council (NPFMC)	Ms. Patricia Livingston
	Dr. Gordon Kruse
North Pacific Research Board (NPRB)	Dr. Francis Wiese
Northwest Association of Networked Ocean Observing Systems (NANOOS)	Dr. Jack Barth
Northwest Pacific Action Plan (NOWPAP)	Dr. Sangjin Lee
	Dr. Alexander Tkalin
Pacific Arctic Group (PAG)	Dr. Jackie Grebmeier
	Dr. Takeshi Kikuchi
Pacific Coast Ocean Observing System (PaCOOS)	Dr. Francisco Werner
Pacific Seabird Group (PSG)	Dr. Ken Morgan
Sir Alister Hardy Foundation for Ocean Science (SAHFOS)	Dr. Sonia Batten
Southern California Coastal Ocean Observing System (SCCOOS)	Dr. J. Anthony Koslow
Scientific Committee on Oceanic Research (SCOR)	Dr. Satoru Taguchi
Surface Ocean Low Atmosphere Study (SOLAS)	Dr. Lisa Miller
	Dr. Yukihiro Nojiri
World Climate Research Programme (WCRP)	Dr. Toshio Suga

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2012-2013 Standing List of International and Regional Organizations and Programs

ACIA	Arctic Climate Impact Assessment Program (ACIA of AMAP)
AFSCAR	American Fisheries Society Program on Climate and Aquatic Resources
AMAP	Arctic Monitoring and Assessment Program
AOOS*	Alaska Ocean Observing System
APEC-MRC	Marine Resources Conservation Working Group, Asia Pacific Economic Cooperation
APEC-FWG	Fisheries Working Group, Asia Pacific Economic Cooperation
APFIC	Asia-Pacific Fisheries Commission
APN	Asia Pacific Network for Global Change Research
Argo*	International Program for deployment of profiling floats
BEST-BSIERP*	Bering Sea Ecosystem Study
CeNCOOS	Central and Northern California Ocean Observing System
CERF	Coastal and Estuarine Research Federation
CLIVAR*	Climate Variability and Predictability Program
ESSAS*	Ecosystem Studies of Sub-Arctic Seas
EVOSTC	<i>Exxon Valdez</i> Oilspill Trustee Council
FAO	Food and Agriculture Organization
GESAMP	Group of Experts on Scientific Aspects of Marine Pollution
GOOS*	Global Ocean Observing System
IAMSLIC	International Association of Marine Science Libraries
IASC	International Arctic Science Committee
IATTC	Inter-American Tropical Tuna Commission
ICES*	International Council for the Exploration of the Sea
IGBP	International Geosphere-Biosphere Program
IHDP	International Human Dimensions Programme on Global Environmental Change
IMBER*	Integrated Marine Biogeochemistry and Ecosystems Research
IMO	International Maritime Organization
IOC*	Intergovernmental Oceanographic Commission
IOCCP*	International Ocean Carbon Coordinated Project
IODE	International Oceanographic Data and Information Exchange

IPCC*	Intergovernmental Panel on Climate Change
IPHC	International Pacific Halibut Commission
ISC	International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean
IWC	International Whaling Commission
NAFO	Northwest Atlantic Fisheries Organization
NANOOS	Northwest Association of Networked Ocean Observing Systems System
NEAR-GOOS*	North East Asian Regional GOOS
NOWPAP*	Northwest Pacific Action Plan
NPAFC*	North Pacific Anadromous Fish Commission
NPFC	North Pacific Fisheries Commission
NPFMC	North Pacific Fishery Management Council
NPRB*	North Pacific Research Board
PaCOOS*	Pacific Coast Observing System
PAG	Pacific Arctic Group
POGO	Partnership for Observing the Global Oceans
PSC	Pacific Salmon Commission
PSG	Pacific Seabird Group
SAHFOS*	Sir Alister Hardy Foundation for Ocean Science
SAON	Sustaining Arctic Observing Networks
SCCOOS	Southern California Coastal Ocean Observing System
SCOPE	Scientific Committee on Problems of the Environment
SCOR*	Scientific Committee on Oceanic Research
SOLAS*	Surface Ocean Low Atmosphere Study
SPC	South Pacific Commission
SPREP	South Pacific Regional Environmental Program
START	South Asian Regional Committee for the System for Analysis, Research and Training
UNEP	United Nations Environment Program

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Financial report for Year 5 (completed on March 31, 2012) of the PICES/MAFF project on “Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim”

BACKGROUND

In April 2007, the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan (JFA), approved funding for a 5-year PICES project entitled “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*”. The goals of the project (completed on March 31, 2012) are to develop international systems to collect, exchange and store relevant data, and to foster partnerships with non-PICES member countries and related international organizations. The contribution is from the Official Development Assistance (ODA) fund, and involvement of developing Pacific Rim countries is required in activities under this project.

PICES and MAFF/JFA agreed upon the following organizational principles for the project:

- The project has two distinct components, one on marine/estuarine non-indigenous species (NIS) and the other one on harmful algal blooms (HABs), and is conducted by two PICES expert groups under the Marine Environmental Quality Committee (MEQ), Working Group on *Non-indigenous Aquatic Species* (WG-21) and Section on *Ecology of Harmful Algal Blooms in the North Pacific* (HAB-S). Each group oversees a specific sub-project.
- The Chairman of MEQ serves as the Project Scientific Coordinator and is responsible for reporting annually to PICES Science Board and MEQ on the scientific implementation of the project. This report should include a summary of the activities carried out for the year, with an evaluation on the progress made, and a workplan for the following year. [Dr. Glen Jamieson (Fisheries and Oceans Canada, E-mail: glen.jamieson@dfo-mpo.gc.ca) was the MEQ Chairman and the Project Scientific Coordinator from April

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2007 to October 2009. Dr. Steven Rumrill (University of Oregon, USA, E-mail: steven.s.rumrill@state.or.us) was elected as the MEQ Chairman at the 2009 PICES Annual Meeting. He has delegated Dr. Jamieson to continue serving as the Project Scientific Coordinator.]

FINANCIAL PRINCIPLES AND BUDGET CATEGORIES

The following financial principles, agreed to by MAFF/JFA and PICES, apply to the project:

- A separate bank account shall be established to deposit the remitted funds;
- The interest earned by the fund shall be credited to the project and used in consultation with JFA;
- Any funds remaining after the completion of every fiscal year of the project shall be reported and disposed of in consultation with JFA;
- Transfers of up to 10% of allocations between the budget categories are allowed based solely on the decision by the PICES Executive Secretary. In special cases, transfers up to 20% between the budget categories can be authorized by JFA. All transfers shall be reported at the end of the fiscal year;
- A 13% overhead on the annual budget shall be retained by PICES to offset expenses related to the Secretariat's involvement in the project (based on communication with JFA in November 2008, the originally approved 10% overhead was changed to 13% starting from *Year 3*);
- The PICES Executive Secretary (Dr. Alexander Bychkov, E-mail: bychkov@pices.int) is responsible for the management of the fund and for reporting annually on its disposition to JFA and PICES Governing Council, within 120 days after the close of each project year ending March 31.

The main elements of the budget are organized into the following categories:

- Travel and meetings
This category covers travel costs associated with project activities (organizational trips, field studies, *etc.*) and organization of project workshops and meetings.
- Contracts
This category covers fees to be paid to consultants and experts employed to implement the project. Tasks and deliverables for contractors have to be determined by the Scientific Coordinator, based on recommendations from a Principal Investigator of a specific sub-project or initiative. The Executive Secretary, in consultation with the Scientific Coordinator, is responsible for selecting contractors. To support the objectives of the project and to ensure that its activities have a minimal impact on the workload of the existing staff of the PICES Secretariat, the Executive Secretary can employ additional staff (*e.g.*, Project Assistant) as required.
- Equipment
This category covers purchases and shipment of equipment for laboratory/field sampling/data processing/analysis, computer hardware/software for development of database(s) and the project website.
- Miscellaneous
This category covers minor expenses associated with the project (mail and phone charges, bank charges, *etc.*) and includes contingencies such as fluctuations in currency exchange rates.

PROJECT BANK ACCOUNT AND PAYMENT HISTORY

The special account for the project was established at the bank used by PICES:

Bank name: TD Canada Trust

Bank number: 004

SWIFT Code: TDOMCATTOR

Branch name: Sidney

Branch number: 00721

Bank Address: 2406 Beacon Avenue, Sidney, BC, Canada V8L 1X4

Account number: 07210 004 8479 5209963

Account holder: North Pacific Marine Science Organization (PICES)

The following summarizes the fund transferring and project reporting to date:

- The set of documents requesting funding for *Year 1* (completed on March 31, 2008) was sent to JFA on June 20, 2007. Funds in the amount of \$184,980 were transferred to the PICES/MAFF bank account on

July 27, 2007. The progress report and the financial report for *Year 1* were submitted to JFA on July 19 and July 23, 2008, respectively.

- The set of documents requesting funding for *Year 2* (completed on March 31, 2009) was sent to JFA on April 3, 2008 and, based on instructions from JFA, to the Consulate General of Japan in Vancouver (Canada) on June 2, 2008. Funds in the amount of \$161,466 were transferred to the PICES/MAFF bank account on July 17, 2008. The financial report for *Year 2* was submitted to JFA on July 21, 2009, and the progress report was sent on August 13, 2009.
- The set of documents requesting funding for *Year 3* (completed on March 31, 2010) was sent to the Consulate General of Japan in Vancouver (Canada) on June 10, 2009. Funds in the amount of \$187,505 were transferred to the PICES/MAFF bank account on July 15, 2009. The progress report and the financial report for *Year 3* were submitted to JFA on July 26, 2010.
- The set of documents requesting funding for *Year 4* (completed on March 31, 2011) was sent to the Consulate General of Japan in Vancouver (Canada) on May 28, 2010, and the requested revisions were directed to JFA on June 24, 2010. Funds in the amount of \$187,505 were transferred to the PICES/MAFF bank account on July 12, 2010. The progress report and the financial report for *Year 4* were submitted to JFA on July 28, 2011.
- The set of documents requesting funding for *Year 5* (completed on March 31, 2012) was sent to the Consulate General of Japan in Vancouver (Canada) on June 10, 2011. Funds in the amount of \$164,641 were transferred to the PICES/MAFF bank account on July 27, 2011. The financial report for *Year 5* and final products (scientific report, brochures, USBs with a MNIS database and “*Atlas of non-indigenous marine and estuarine species in the North Pacific*”, are due by July 31, 2012.

BUDGET EXECUTION FOR FISCAL YEAR 5

The budget allocated for *Year 5* was \$164,641. The proposed budget breakdown and actual expenses for each of the budget categories, and the project account balance as of March 31, 2012 are shown in Table 1. The combined surplus of \$62,001 for *Year 3* and *Year 4* was distributed among the budget categories as shown in column 2 of Table 1 (numbers in blue). Table 2 provides more details on actual expenses of the major categories.

Table 1 Allocations and expenses for *Year 5*.

Category	Year 5 Allocation + Previous Surplus	Actual Expenses	Remainder
Travel & meetings	103,000+44,000 = 147,000	138,996	8,004
Contracts	33,000+6,000 = 39,000	40,886	(1,886)
Equipment	7,000+11,500 = 18,500	25,573	(7,073)
Miscellaneous	238+501 = 739	73	666
Overhead	21,403	21,403	0
Total	226,642	226,931	(289)
Interest earned			289
Account Balance			0

Table 2 Breakdown of expenses for various budget categories for Year 5.

Category/Activity	Expenses
Travel & meetings	138,996
PICES/MAFF workshop on “ <i>Rapid assessment survey methodologies for detecting non-indigenous marine species</i> ” (July 19–21, 2011, Marine Biological Center, Phuket, Thailand)	24,249
Travel support for one speaker and 12 students to participate in the 7th International Conference on Marine bioinvasions (August 23–25, 2011, Barcelona, Spain)	6,932
Travel of PICES experts to Indonesia (September 2011 and February 2012) for preparation and conducting of the 3 rd PICES/MAFF HAB training course	35,959
Fourth PICES/MAFF rapid assessment survey (October 7–14, 2011, Vostok, Russia), held in conjunction with the 2011 PICES Annual Meeting (Khabarovsk, Russia)	20,558
Travel for NIS sub-project PI and WG 21 Co-Chairman to report on the MNIS component of the project at the 2011 Annual Meeting (October 2011, Khabarovsk, Russia)	12,353
PICES/MAFF demonstration workshop on “ <i>An introduction to rapid assessment survey methodologies for application in developing countries</i> ” (February 8–9, 2012, Seikai National Fisheries Research Institute, Nagasaki, Japan)	23,294
MNIS Synthesis Meeting (March 20–23, 2012, Newport, U.S.A.)	7,797
Travel for the HABs sub-project PI to report on the HAB component of the project at the 2012 FUTURE Workshop and inter-sessional Science Board Meeting (May 22–26, 2012, Pusan, Korea)	1,618
Travel of PICES experts to Indonesia (September 2012) to review the progress made since the 3 rd PICES/MAFF HAB training course	6,236
Contracts	40,886
Macro photo images for NIS database	1,234
To select, order and test equipment/materials to be used for a HAB training program in developing countries (Mr. Julian Herndon, San Francisco State University)	7,970
To provide assistance to project Coordinators and sub-project Principle Investigators (Ms. Rosalie Rutka, Stranby Technical Services)	29,792
To design final colour brochures for both sub-projects (Ms. Melinda Stephenson, Alkemi Creative)	1,890
Equipment	25,573
Equipment and materials for a HAB training program in developing countries	23,293
Purchase of USBs for NIS database and “ <i>Atlas of non-indigenous marine and estuarine species in the North Pacific</i> ” for distribution to JFA and PICES community	2,280
Miscellaneous	73
Overhead	21,403

AUDIT OF THE ACCOUNT

According to the PICES Financial Regulations (http://www.pices.int/about/financial_regulations.aspx; *Regulations 11 and 13*), all our accounts and financial statements are subject of an external audit. The auditing firm *Flader, Hale & Hughesman* (formerly *Flader & Hale*) has been serving as the PICES external auditor since 2003 (Decision 03/A/1(ii)). At the 2008 PICES Annual Meeting, Council agreed to retain this firm as the external auditor for *FYs 2009–2011* (Decision 08/A/1(ii)).

The status of the MAFF account, for the period from April 1 to December 31, 2011, was assessed during the regular PICES audit for *FY 2011*. The financial statements were submitted to the auditor on March 26, 2012, and the audit was completed on May 3. The electronic copy of the Auditors' Report was received and circulated to all Contracting Parties on May 4. In the auditor's opinion, the financial statements present fairly, in all material respects, the financial position of the North Pacific Marine Science Organization as at December 31, 2011, and the results of its operations and changes in fund balances for the year then ended. The financial statements for the rest of *Year 5* of the MAFF project (January 1 to March 31, 2012) will be evaluated during the regular PICES audit for *FY 2012*.

GC Endnote 8

Report on the performance evaluation of the Executive Secretary for 2011

In accordance with Decision 07/A/7(i) (Appendix 1), the Executive Committee of Council for evaluating the annual performance of the Executive Secretary (hereafter "Committee") reviewed the 2011 annual performance of Dr. Alexander Bychkov, the Executive Secretary of the Organization, based on his report (available on request). The Committee determined his performance pay for this period, following the general guidelines for executive positions in the Canadian Public Service system, and also established his commitments for 2012. All discussions and decisions were made by correspondence among the Committee members. Before making the final decision, the Committee explained to Dr. Bychkov the rating for his performance in 2011, and the commitments for 2012, and he agreed with both.

Setting the criteria for rating and performance pay calculation

The salary of the Executive Secretary is based on the EX-2 level at the Department of Fisheries and Oceans (DFO), Canada. Therefore, the Committee set the ratings to define Dr. Bychkov's performance and the criteria for his performance pay based on the current practice for executive positions in the Canadian Public Service system (Appendix 2).

Commitments in 2011

Dr. Bychkov's commitments in 2011 were as follows:

- a. Managing the budget of the Organization and implementing the Organization's financial regulations;
- b. Administrating the Secretariat personnel/office;
- c. Planning and organizing the 2011 Annual Meeting;
- d. Providing secretarial services to meetings/symposia/conferences approved by Council;
- e. Coordinating the publication program of the Organization;
- f. Intensifying the cooperation with other organization/programs;
- g. Fund-raising for prioritized activities of the Organization in 2011 and beyond.

Items (a) to (e) are essential for administration of the Organization and are consistent with *Rule 10* of the PICES Rules of Procedure that spells out the responsibilities of the Executive Secretary. Cooperation with other organizations is highly important to advance the PICES scientific agenda and to incorporate a North Pacific perspective into global scientific activities. Given the current stringent funding situation of the Contracting Parties, fund-raising is also a very important activity to maintain the Organization at its present

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level of activities, which is the rationale for items (f) and (g) to be added to the tasks of the Executive Secretary.

Evaluation 2011 accomplishments

The Executive Secretary as the Chief Executive Officer of PICES, is quite important for managing the Organization. With the initiation of FUTURE, the second integrative science program of the Organization, there has been an increase in the planning and activities in PICES to ensure the success of this program. Dr. Bychkov's accomplishments on the ongoing commitments (items (a)-(e)) fulfilled our expectations, even though there were many difficulties encountered.

Besides the annual contributions from Contracting Parties, PICES funds to be managed include various grants and voluntary contributions. Dr. Bychkov appropriately managed and executed funds in accordance with PICES Financial Regulations and Canadian generally accepted accounting principles. The 2011 Annual Meeting (PICES-2011) in Khabarovsk, Russia was very successful, with almost 330 participants from 17 countries and 28 organizations/programs. PICES also held or contributed to the planning and support for 20 inter-sessional events in 2011. Logistical and financial arrangements provided by the Secretariat were essential for the success of the Annual Meeting and inter-sessional events. The most important inter-sessional event was the 5th International Zooplankton Production Symposium on "*Population connections, community dynamics, and climate variability*" held in March 2011, in Pucón, Chile. There were almost 300 scientists from 36 countries in attendance and 159 talks and 203 posters were presented, which was an outstanding success. Preparations, arrangements, and planning for other international symposia to be held in 2012 are underway, including the 2nd PICES/ICES Conference for Early Career Scientists (April 24-27, 2012, in Majorca, Spain) and the 2nd International Symposium on "*Effects of climate change on the world's oceans*" (May 14-20, 2012, in Yeosu, Korea). Dr. Bychkov was a very effective manager of the Secretariat staff, including the PICES interns. In addition, significant progress was made in implementing the Action Plan for the PICES Publication Program, especially with respect to establishing a License Agreement with ProQuest Science Journals database to ensure indexing of all PICES publications to the article level.

His performance was also significant for the additional commitments (items (f) and (g)). PICES cooperation with other organizations and programs is becoming very strong and is making PICES a much more visible and important contributor to international marine science programs. The cooperation developing with ICES is particularly notable and important in this regard. With respect to fund-raising, the amount of funds from voluntary contributions, grants, and partnerships of PICES exceeded the total annual contribution by Contracting Parties.

Based on his accomplishments in 2011 mentioned above, the Committee judged his overall performance as "Succeeded+", in accordance with the practice of performance evaluation by the Canadian Government.

Setting the performance pay for 2011

In accordance with the practice of the Canadian Public Service system, an executive is eligible for a maximum of 12% performance pay ("at-risk pay"), except for the candidate evaluated as "Did not meet". In addition, if performance is evaluated as "Surpassed", then the executive is eligible for a maximum of 3% bonus (Appendix 2). The Committee evaluated Dr. Bychkov's overall performance for 2011 as "Succeeded+". Because the Committee also considered that his tasks in 2011 were quite difficult, the Committee decided that a performance pay equal to 12% of his salary would be appropriate for this period.

Setting commitments for 2012

The Committee set Dr. Bychkov's commitments in 2012 as follows. Items (a) to (e) are essential for administration of the Organization in 2012 and correspond to Article 10 of the PICES Rules of Procedure as the responsibility of the Executive Secretary. In addition, cooperation with other organization and programs is

quite important for developing the scientific ability of PICES. Under the current severe funding situation in Contracting Parties, fund-raising continues to be an important task in order to sustain the Organization at the present level of activities. Therefore, the Committee added items (f) and (g).

- a. Managing the budget of the Organization and implementing the Organization's financial regulations;
- b. Administrating the Secretariat personnel/office;
- c. Planning and organizing the Annual Meeting;
- d. Providing secretarial services to meetings/symposia/conferences approved by Council;
- e. Coordinating the publication program of the Organization;
- f. Intensifying the cooperation with other organization/programs;
- g. Fund-raising for prioritized activities of the Organization in 2012 and beyond.

Recommendations with respect to the Executive Secretary position

The appointment of the Executive Secretary is mentioned in *Article VIII* of the PICES Convention (<http://www.pices.int/about/convention.aspx>) and, according to *Rule 3(iii,b)* of the PICES Rules of Procedure (http://www.pices.int/about/rules_procedure.aspx), requires consensus of all Contracting Parties. His/her main duties and responsibilities are spelled out in *Rule 10* of the Rules of Procedure.

The Executive Secretary position was last advertised in 1998. Dr. Bychkov was appointed to this position for a 5-year term starting June 1, 1999, re-appointed for a second 5-year term (June 1, 2004 to May 31, 2009) in 2002, and for a third 5-year term (June 1, 2009 to May 31, 2014) in 2008. Because the decision on the Executive Secretary's position shall be made at least 12 months prior to the end of the current term, this issue has to be brought to Council at the 2012 PICES Annual Meeting.

The Organization can take several approaches to fill the Executive Secretary position after the completion of Dr. Bychkov's current term on May 31, 2014:

1. advertise the position, carry out the competition, and select a new Executive Secretary;
2. extend Dr. Bychkov's term (*e.g.*, for 2.5 years - until December 31, 2016, allowing him to have 20 years of service to PICES (including 3 years as the Assistant Executive Secretary) and to organize and run the 25th Anniversary Annual Meeting);
3. re-appoint Dr. Bychkov for another 5-year term.

Given the importance of the planning necessary for a successful 25th Anniversary Annual Meeting, it is the recommendation of this committee that options (2) and (3) be advanced for discussion and approval of one of these by the PICES Finance and Administration and Governing Council at PICES-2012.

Appendix 1

Executive Committee of Council for evaluating the Executive Secretary performance

DECISION 2007/A/7

- i. In accordance with Financial Regulations 12(i), Council established an Executive Committee to complete annual performance review of the Executive Secretary. Terms of reference and membership of the Executive Committee are listed in *GC Appendix B*.
- ii. At its first meeting, the Executive Committee will review achievements of the current Executive Secretary for the previous three years, in preparation for his possible re-appointment. As decision on re-appointment shall be made at least 12 months prior to the end of the term, Council agreed, in accordance with the Article VII of the Convention and Rule 4 of the Rules of Procedure, to vote on the results of the evaluation by correspondence before April 30, 2008.

GC APPENDIX B

Terms of reference

1. The Executive Committee will complete an annual review of the Executive Secretary performance by April 1 each year, following the general guideline for executive positions in the Canadian public service, and will report to Council at each Annual Meeting.
2. The review will include a written description of achievements for the previous year and tasks for the coming year, along with an overall evaluation of the achievements.
3. The evaluation will be used to set the level of performance pay, following the Canadian policy for executives.

Membership

The Executive Committee will be chaired by the PICES Chairman, with the Chairmen of Science Board and F&A Committee as members.

Appendix 2

Current criteria of rating the performance of and current levels of pay for the executive position of the Canadian Public Service

Ratings are based on results achieved (the *What*), as well as how they were achieved (the *How*). Overall performance is evaluated with the following possible results:

- **Surpassed:** Went well beyond performance expectations.
- **Succeeded+:** Exceeded the performance expectations. Or, fully succeeded in a position of greater scope and complexity in relation to those of other executive level jobs.
- **Succeeded:** Has fully achieved the performance expectations.
- **Succeeded-:** Did not fully succeed in meeting performance expectations. Or, while succeeded, it was in a position with performance expectations of less scope and complexity in relation to those of other executive level jobs.
- **Did not Meet/Unable to Assess:** Did not achieve performance expectations or unable to assess the performance during the cycle (due to leave, training, special assignment).

The following table illustrates the range of performance awards available according to rating level and the executive's level. Note that these awards do not affect the base salary.

Performance Level	Lump Sum Performance Awards	
	At-Risk Pay	* Bonus
0 (Unable to Assess)	x	x
1 (Did not meet)	x	x
2 (Succeeded-)	✓ EX 1-3: up to 12% of base salary	x
3 (Succeeded)		x
4 (Succeeded +)		x
5 (Surpassed)		✓ EX-1 to EX-3: up to an additional 3%

GC Appendix A**2012 Governing Council decisions****2012/A/1: Auditor**

- i. Council accepted the audited accounts for *FY* 2011.
- ii. Council authorized the Executive Secretary to sign a new 3-year contract (for *FYs* 2012-2014) with the current auditor *Flader, Hale & Hughesman*.

2012/A/2: Annual contributions

- i. Council re-iterated that for planning of their funding requests for annual contributions, Contracting Parties should continue to use the guideline generally accepted at PICES-1999 (Decision 1999/A/2(ii)), which states that the annual contributions will increase at the rate of inflation in Canada.
- ii. Council instructed the Executive Secretary to send a letter to the Contracting Parties regarding the need for timely payment of the annual contribution and describing the difficulties that late and/or partial payment causes the Organization.

2012/A/3: Budget and fund-raising

- i. Council accepted the estimated accounts for *FY* 2012.
- ii. Council approved the *FY* 2013 budget of \$850,000. The amount of \$113,200 will be transferred from the Working Capital Fund to balance the budget, setting the total annual contribution at \$736,800, and the 2013 annual fee at \$122,800 per Contracting Party.
- iii. Council approved a transfer from the Working Capital Fund to the Relocation and Home Leave Fund in order to bring the balance of this fund to \$100,000.
- iv. Council approved a transfer from the Working Capital Fund to the Trust Fund to recover the 2012 expenses, and to restore the Trust Fund to the level of \$110,000. This transfer will include \$11,870 from the amount remaining in the PICES-2010 Annual Meeting fund.
- v. Council agreed that the available balance of funds in the Working Capital Fund as of December 31, 2012, from the 2011 Zooplankton Production Symposium and 2012 PICES/ICES Conference for Early Career Scientists be allocated for the development of the PICES integrative science program on “*Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Ecosystems*” (FUTURE).
- vi. Council approved a lump sum employer contribution of \$20,000 from the *FY* 2013 budget and an additional lump sum payment from a *FY* 2012 surplus in the General Fund to the International Fisheries Commission Pension Plan to pay down unfunded liabilities.

2012/A/4: Future PICES Annual Meetings and 2013 inter-sessional Science Board meeting

- i. Considering that PICES-2012 was the first Annual Meeting for which the structure was in accordance with the entire suite of recommendations by the Study Group on *Restructuring of the PICES Annual Meeting* (SG-RAM), Council decided to discuss the effectiveness of the approved changes in the format of the Annual Meeting at PICES-2013.
- ii. Council approved the theme description, “*Communicating forecasts, uncertainty and consequences of ecosystem change to society*”, for PICES-2013 to be held from October 11-20, 2013, in Nanaimo, British Columbia, Canada.
- iii. Council requested an answer from China by the end of November 2012, regarding its ability to host PICES-2014, and agreed to consider the following options if China is unable to host PICES-2014: (1) asking Korea if it might be prepared to host PICES-2014 and give China the opportunity to host PICES-2015, (2) holding PICES-2014 at the seat of the Secretariat, or (3) merging the FUTURE Open Science Meeting and PICES-2014.
- iv. Assuming that China agrees to host PICES-2014, Council, following the established 6-year rotation cycle, requested Korea to explore the possibility of hosting PICES-2015, and inform the Secretariat on this matter by March 31, 2013.

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- v. Council agreed to keep the same registration fee structure for PICES-2013 as for PICES-2010 through PICES-2012:

Type of registration fee	CDN \$
Regular	275
Early	200
Student	50
Spousal/guest	50

- vi. Council approved an inter-sessional Science Board meeting to be held May 20–21, 2013, immediately prior to a 3-day joint PICES/ICES FUTURE-related workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*” to be convened May 22–24, 2013. Both events are to be hosted by Russia in St. Petersburg.

2012/A/5: Twenty-Fifth Anniversary of PICES

Council approved the formation of a planning committee for the twenty-fifth anniversary of PICES, consisting of the Chairman of the Finance and Administration (F&A) Committee, Chairman and Vice-Chairman of Science Board, Executive Secretary, and a representative from each of the Contracting Parties. The group’s responsibility would be to direct the planning of activities, budget and fund-raising for this celebration. Council instructed the F&A Committee Chairman to draft the terms of reference for the group (see *GC Appendix B*).

2012/A/6: PICES Visiting Scientist Program

Council approved the revised description of the PICES Visiting Scientist Program (see *GC Appendix B*) and instructed the Executive Secretary to send a letter to the Contracting Parties, requesting their proposals for contributions to the Program.

2012/A/7: PICES Intern Program

- i. Considering funding currently available for the Intern Program and stated intentions for contributions by Contracting Parties, Council agreed to extend the period of appointment for the 2012 intern, Dr. Zhuojun Ma (China), to a possible maximum of 12 months, and to initiate the process to obtain the 2013 intern, with the understanding that the intern’s term will start no earlier than July 2013. Following the existing rotation cycle, Russia was requested to nominate the intern by January 31, 2013.
- ii. Council instructed the Executive Secretary to invite Contracting Parties to provide voluntary contributions to the Trust Fund to support the Intern Program in 2013 and beyond.

2012/A/8: World Ocean Assessment (UN Regular Process for Global Reporting and Assessment of the State of the Marine Environment)

Council pointed out the importance of facilitating the conduct of the World Ocean Assessment and agreed to:

- (1) encourage individuals in the PICES network to join the *Pool of Experts*, the body from which the *Group of Experts* will select authors and reviewers of the first World Ocean Assessment;
- (2) promote the development of North Pacific workshop(s) to enable incorporation of regional knowledge into the first World Ocean Assessment report;
- (3) consider means by which PICES products are visible in the World Ocean Assessment.

2012/A/9: Improvement of participation in PICES activities

- i. In order to better assess problems existing in Contracting Parties with the participation of their scientists in the activities of the Standing Committees and their subsidiary bodies, and in the Annual Meetings of the Organization, Council instructed the Executive Secretary to continue regularly preparing and circulating to Contracting Parties information on participation of their scientists in the Annual Meetings.
- ii. Council re-iterated the necessity for Contracting Parties to: (1) regularly review their national membership, and to provide the updated national membership list to the Secretariat by the first day of the calendar year (January 1), and (2) follow up on *Rule 1(ii)* of the PICES Rules of Procedure in providing the national delegation list for Annual Meetings.

2012/A/10: Election of Chairman and Vice-Chairman

- i. Dr. Laura Richards (Canada) was unanimously elected as the Chairman of PICES for a 2-year term (2012–2014) to replace Dr. Lev Bocharov (Russia). As Dr. Bocharov will resume his duties as the Russian national delegate, Council agreed that Dr. Tokio Wada (Japan) will continue to serve as the Past-Chairman.
- ii. Dr. Chul Park (Korea) was unanimously elected as the Vice-Chairman of PICES for a 2-year term (2012–2014) to replace Dr. Laura Richards.

2012/A/11: Appointment of F&A Committee Chairman

Dr. John Stein (U.S.A.) was appointed as the Chairman of the F&A Committee for a 2-year term (2012–2014).

2012/A/12: PICES Secretariat

- i. Council extended the term of the Executive Secretary until December 31, 2014;
- ii. Council agreed to consider a complex of issues related to the structure and staffing of the Secretariat at PICES-2013 and, in preparation for this discussion, directed the F&A Chairman to work with the Executive Secretary over the next year to (1) prepare position descriptions for both the Executive Secretary and the Deputy Executive Secretary, (2) develop the process and timeline for staffing the Deputy Executive Secretary position, and (3) review the organizational structure and salary budget of the Secretariat.

2012/S/1: PICES Integrative Science Program, FUTURE

- i. Council approved activities and timelines for FUTURE (FUTURE roadmap) proposed by Science Board, with the addition of a footnote to the suggested timeline of delivering the next edition of the North Pacific Ecosystem Status Report (NPESR-3), stating “under the condition that NPESR-2 is fully completed”.
- ii. Council requested that the Executive Secretary send a letter to the Contracting Parties providing information on planned activities for FUTURE and requesting contributions to these activities, particularly for the 2014 FUTURE Open Science Meeting.

2012/S/2: 2013 PICES Annual Meeting

- i. The following scientific sessions are to be convened at PICES-2013:
 - ¾-day Science Board Symposium on “*Communicating forecasts, uncertainty and consequences of ecosystem change to society*”;
 - 1-day BIO Contributed Paper Session;
 - 1-day BIO/FIS Topic Session on “*Marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being*”;
 - ½-day BIO/FIS/POC Topic Session on “*Are marine ecosystems of the North Pacific becoming more variable?*”;
 - 1-day BIO/FIS/MEQ/TCODE/FUTURE Topic Session on “*Ecosystem indicators to characterize ecosystem responses to multiple stressors in North Pacific marine ecosystems*”;
 - 1-day BIO/POC/MONITOR/TCODE/FUTURE Topic Session on “*Recent trends and future projections of North Pacific climate and ecosystems*”;
 - 1-day FIS Contributed Paper Session;
 - 1-day FIS/FUTURE Topic Session on “*Science needs for offshore oil and gas development in the North Pacific*”;
 - 1-day FIS/TCODE Topic Session on “*Banking on recruitment curves; returns on intellectual investment*”;
 - ½-day MEQ Contributed Paper Session;
 - ½-day MEQ/FUTURE Topic Session on “*Status, trends and effects of pollutants in coastal ecosystems: Implications for wildlife and humans*”;
 - 1-day MONITOR Topic Session on “*Towards the development of low-cost cooperative ocean monitoring networks* [the title was changed to “*Cost-effective, cooperative ocean monitoring*”];

- 1-day POC Contributed Paper Session;
 - 1-day POC Topic Session on “*The changing carbon cycle of North Pacific continental shelves and marginal seas*”.
- ii. The following workshops are to be convened at PICES-2013:
- 1-day PICES/ICES Workshop on “*Comparison of size-based and species based ecosystem models*”;
 - 1-day PICES/ICES Workshop on “*Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and "data dreams" for the future*”;
 - 1-day BIO Workshop on “*Marine bird and mammal spatial ecology*”;
 - ½-day MEQ Workshop on “*The economic impacts of harmful algal blooms on fisheries and aquaculture*”;
 - 1-day MEQ Workshop on “*Traditional seafoods of coastal aboriginal communities in the North Pacific: Insight into food, social and ceremonial uses at Snuneymux’w First Nation in Nanaimo, British Columbia*”;
 - 1-day TCODE Workshop on “*Tools, approaches and challenges for accessing and integrating distributed datasets*”;
 - 1-day FUTURE Workshop on “*Evaluating tools for assessment of species vulnerability to anthropogenic climate change*”.
- iii. The following business meetings are to be held at PICES-2013:
- ¼-day Science Board (SB) meeting (October 13) and ½-day SB meeting (October 18 afternoon and October 19);
 - 1½-hour overture meetings (October 13 evening) and ½-day meetings of Scientific and Technical Committees (October 16 afternoon);
 - 1-day meeting of the SB Section on *Human Dimensions of Marine Systems*;
 - ½-day meeting of the BIO/FIS/POC Section on *Climate Change Effects on Marine Ecosystems*;
 - 1-day meeting of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific*;
 - ½-day meeting of the POC/BIO Section on *Carbon and Climate*;
 - 1-day meeting of the MEQ Working Group on *Non-indigenous Aquatic Species*;
 - 1-day meeting of the BIO Working Group on *Jellyfish Blooms around the North Pacific Rim*;
 - ¾-day meeting of the POC Working Group on *North Pacific Climate Variability and Change*;
 - 1-day meeting of the MEQ/BIO Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors*;
 - ½-day meeting of the POC Working Group on *Regional Climate Modeling*;
 - 1-day meeting of the BIO Advisory Panel on *Marine Birds and Mammals*;
 - ½-day meeting of the POC/MONITOR Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas*;
 - ½-day meeting of the MONITOR Advisory Panel on the *Continuous Plankton Recorder Survey in the North Pacific*;
 - 1-day meeting of the MEQ Study Group on *Marine Pollutants*;
 - ½-day concurrent meetings of the FUTURE Advisory Panels on *Anthropogenic Influences on Coastal Ecosystems, Climate, Oceanographic Variability and Ecosystems* and *Status, Outlooks, Forecasts, and Engagement*, preceded by a ½-day joint meeting of these Panels.

2012/S/3: Inter-sessional symposia/sessions/workshops/meetings

The following inter-sessional events are to be convened/co-sponsored in 2013 and beyond:

- i. Symposia/conferences:
- International Symposium on “*Climate variability and change on marine resources and fisheries: Toward a South Pacific Integrated Ecosystem Studies Program (SPICES)*”, January 7–10, 2013, Concepción, Chile (co-sponsored by PICES);
 - IMBER IMBIZO III on “*The future of marine biogeochemistry, ecosystems and societies: Multi-dimensional approaches to the challenges of global change in continental margins and open ocean systems*”, January 28–31, 2013, Goa, India (co-sponsored by PICES);
 - 4th International Jellyfish Bloom Symposium, June 5–7, 2013, Hiroshima, Japan (co-sponsored by PICES);

- 8th International Conference on Marine Bioinvasions, August 20–22, 2013, Vancouver, Canada (co-sponsored by PICES);
 - 1st FUTURE Open Science Meeting, April 2014, Honolulu, U.S.A.;
 - ICES Symposium on “*Ecological basis of risk analysis for marine ecosystems*”, June 2–6, 2014, Helsinki, Finland (co-sponsored by PICES);
 - 3rd International Symposium on “*Effects of climate change on the world’s oceans*”, spring 2015, Brazil (primary international sponsors: PICES, ICES and IOC).
- ii. Joint Theme Sessions:
- CLIVAR/PICES Theme Session on “*Biophysical interactions*” at the 2nd International Symposium on “*Boundary Current dynamics: Its connection with open-ocean, coastal processes, biophysical interactions and responses to global climate change*”, July 8–13, 2013, Lijiang, China;
 - ICES/PICES Theme Sessions on “*Marine litter*” (Session A), “*Responses of living marine resources to climate change and variability: Learning from the past and projecting the future*” (Session B), “*Do food web dynamics matter in fisheries management?*” (Session E), and “*Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for the future*” (Session M), at the 2013 ICES Annual Science Conference, September 23–27, 2013, Reykjavik, Iceland.
- iii. Workshops and meetings:
- 2-day workshop to exchange views on the idea of developing a scientific focus within PICES on understanding the quantities and distributions of radionuclides in the North Pacific, March 2013, Xiamen, China;
 - 5-day PICES/ICES/GEOHAB workshop on “*Harmful algal blooms in a changing world*”, March 18–22, 2013, Friday Harbor, WA, U.S.A.;
 - 2-day inter-sessional Science Board meeting, May 20–21, 2013, St. Petersburg, Russia;
 - 3-day PICES/ICES workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*”, May 22–24, 2013, St. Petersburg, Russia;
 - 1-day inter-sessional meeting of the Working Group on *Jellyfish Blooms around the North Pacific Rim* prior to the 4th International Jellyfish Bloom Symposium, June 4, 2013, Hiroshima, Japan;
 - 3-day workshop on “*Development and application of Regional Climate Models-IP*”, September 3–5, 2013, Busan, Korea.
- iv. Capacity development events:
- PICES Summer School on “*Ocean observing systems and ecosystem monitoring*”, August 19–23, 2013, Hatfield Marine Science Center, Newport, U.S.A.
 - 6th SOLAS Summer School, August 23–September 2, 2013, Xiamen, China (co-sponsored by PICES);
 - NOWPAP/PICES training course on “*Remote sensing data analysis*”, fall 2013, Qingdao, China;
 - 2014 PICES Summer School on “*Ecological modeling*”, August 18–21, 2014, Seoul, Korea.

2012/S/4: Travel and representation at the meetings of other organizations/programs

- i. 2013 PICES Annual Meeting:
- Invited speakers for Science Board Symposium and Topic Sessions, with the normal allocation of approximately \$5,000 per Committee/Program; additional requests are subject to fund availability;
 - One invited speaker for each of the approved workshops (see 2012/S/2(ii)).
- ii. Inter-sessional events:
- PICES representative to participate in the ESSAS (Ecosystem Studies of Sub-Arctic Seas) Annual Meeting on “*Climate Effects on Spatial Dynamics of Sub-Arctic and Arctic Marine Ecosystems*” and the ESSAS Scientific Steering Committee Meeting (January 7–11, 2013, Hakodate, Japan);
 - PICES representative(s) to attend the 22nd Session of IODE (International Oceanographic Data and Information Exchange) of IOC-UNESCO (March 11–15, 2013, Ensenada, Mexico);
 - PICES representative to attend the NPAFC CSRS (Committee on Scientific Research and Statistics) meeting (April 23–24, 2013, Honolulu, U.S.A.);
 - PICES representative to participate in the 27th Session of the IOC (Intergovernmental Oceanographic Commission of UNESCO) Assembly (June 2013, Paris, France);

- PICES representative to give a seminar at the ISC (International Scientific Committee for Tuna and Tuna-like Species) Annual Meeting (July 17–22, 2013, Busan, Korea) focusing on environmental data availability and modeling capabilities and possible techniques for incorporating this information into ISC stock assessments;
- PICES representatives and convenors for the joint Theme Sessions to participate in the ICES Annual Science Conference (September 23–27, 2013, Reykjavik, Iceland);
- PICES representative to attend the SCOR (Scientific Committee on Oceanic Research) Executive Committee Meeting (November 25–28, 2013, New Zealand);
- PICES representative to participate in the 18th NOWPAP (Northwest Pacific Action Plan) Intergovernmental Meeting (TBD).

2012/S/5: Publications

- i. The following publications are to be produced in or submitted to primary journals in 2013:
 - Special issue of *ICES Journal of Marine Science* based on selected papers from the 2nd International Symposium on “*Effects of climate change on the world’s oceans*” to be published in 2013;
 - Special issue of *Progress in Oceanography* on modeling dedicated to Dr. Bernard Megrey (Guest Editors: E. Curchitser and S.I. Ito) to be published in 2013;
 - Special issue of *Progress in Oceanography* based on selected papers from the 2012 Topic Session on “*Advances in understanding the North Pacific Subtropical Frontal Zone ecosystem*” (Guest Editors: T. Ichii, S. McKinnell and M. Seki) to be submitted in 2013;
 - Special issue of *Fisheries Science* based on selected papers from the 2012 Topic Session on “*Social-ecological systems on walley Pollock and other commercial gadids under changing environment: Inter-disciplinary approach*” (Guest Editors: K. Criddle, S. Kim, M. Makino, I. Perry, Y. Sakurai and A. Velikanov) to be submitted in 2013;
 - Review paper in a peer-reviewed journal based on the results from the 2013 PICES/ICES/GEOHAB workshop on “*Harmful algal blooms in a changing world*” to be submitted in 2013;
 - Set of papers in a peer-reviewed journal based on the results from the 2013 PICES/ICES workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*” to be submitted in 2013.
- ii. The following publications are to be produced in the PICES Scientific Report series in 2013:
 - Final Report of the Working Group 21 on *Non-indigenous Aquatic Species* (Editors: D. Smith and T. Therriault);
 - Final Report of the Working Group 23 on *Comparative Ecology of Krill in Coastal and Oceanic Waters Around the Pacific Rim* (Editors: W. Peterson and T. Shaw);
 - Final report of the Working Group 24 on *Environmental Interactions of Marine Aquaculture* (Editors: K. Abo, B. Dumbauld and S. Johnson);
 - Final report of the Study Group on *Marine Pollutants* (Editor: P. Ross);
 - Report of the 2012 GLOBEC/PICES/ICES Workshop on “*Forecasting ecosystem indicators with process-based models*” (Editors: E. Di Lorenzo, A. Miller and S. Minobe);
 - Final report for the Climate Change and Carrying Capacity Program (Editor: H. Batchelder).
- iii. Other publications to be produced in 2013 include:
 - a. Announcement, poster and Book of Abstracts for PICES-2013 (October 12–21, 2013, Nanaimo, Canada);
 - b. Two regular issues of PICES Press to be published on the website and distributed electronically in January (Vol. 21, No. 1) and July (Vol. 21, No. 2) of 2013;
 - c. PICES E-news to be published on the website and distributed electronically (4 issues per year).

2012/S/6: Future of current PICES expert groups

- i. The FIS/MEQ Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24) completed the terms of reference and will be disbanded.
- ii. To allow the development of a proposal for future activities on non-indigenous species within PICES, the life span of the MEQ Working Group on *Non-indigenous Aquatic Species* (WG 21) was extended for 1 year (until October 2013).

- iii. To allow the development of a proposal for future activities on marine pollutants within PICES, the life span of the MEQ Study Group on *Marine Pollutants* (SG-MP) was extended for 1 year (until October 2013).
- iv. Changes in the terms of reference for the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific* (S-HAB) are to be discussed at ISB-2013 under the revised MEQ Action Plan.

2012/S/7: New PICES expert groups

Following the process decided by Council at PICES-2012, a Study Group on *Radionuclide Science in the North Pacific Ocean* (SG-RS) was established under the direction of Science Board, with terms of reference as described in *GC Appendix B*.

2012/S/8: Chairmanship and membership for Science Board, Standing Committees and expert groups

- i. To facilitate the continuity of Science Board affairs, Council established a Science Board Chairmanship position to allow the election of the Chairman of Science Board one year before the official change of the chairmanship (Decision 2006/A/11). Dr. Thomas Therriault (Canada) was unanimously elected for this position.
- ii. The following reflects changes in Chairmanship and Vice-Chairmanship for Standing Committees:
 - Mr. Chuanlin Huo (China) was elected as the Chairman of MEQ to replace Dr. Steven Rumrill (U.S.A.);
 - Ms. Darlene Smith (Canada) was elected as the Vice-Chairman of MEQ to replace Dr. Mitsutaku Makino (Japan);
 - Dr. Phillip Mundy (U.S.A.) was approved as the Chairman of AP-SOFE to replace Mr. Robin Brown (Canada).

2012/S/9: Relations with other organizations and programs

Council approved the revised *Standing List of International and Regional Organizations and Programs* and agreed with the identified priorities for interaction in 2012–2013 (see *GC Endnote 6*).

GC Appendix B

PICES 25th Anniversary Planning Committee

The 25th anniversary of the North Pacific Marine Science Organization (PICES) is on the horizon (the 25th Anniversary Annual Meeting will be held in 2016) and is worthy of celebration, reflection and looking forward. PICES was established in 1992 to promote and coordinate marine scientific research in the northern North Pacific and adjacent seas, and has made significant contributions to this mission through its scientific programs and other activities. The 25th Anniversary of PICES provides an important opportunity for the Organization and its member countries to recognize the accomplishments to date and to look forward to the next 25 years.

The formation of a Planning Committee for the 25th Anniversary of PICES was approved at the 2012 PICES Annual Meeting.

Terms of Reference

1. To direct the planning of events, activities and products for the PICES 25th Anniversary year that:
 - a. summarize the scientific accomplishments and advancements to date that are related to marine science in the North Pacific;
 - b. promote and highlight both the scientific importance of PICES accomplishments and associated benefits to member countries;
 - c. provide an opportunity to look forward to future advancements in marine science in the next 25 years.
2. To prepare the budget and plan fund-raising activities for the PICES 25th Anniversary year;
3. To report annually to F&A and GC on progress, with final recommendations and associated financial implications due for presentation at PICES-2014.

Examples of activities and products to be considered include:

- Web products such as: a 25th anniversary photo album highlighting people and events over PICES history, interactive historical timeline of PICES, video of PICES accomplishments, 25 photos that depict 25 years of PICES, *etc.*;
- Publications such as: a 25th anniversary edition of PICES news and a special journal issue that highlights the science advancements of PICES and future of marine science in the North Pacific;
- Events such as: a 25th anniversary gala with invited dignitaries and scientists from PICES history and key partners, including ICES, IOC, SCOR, *etc.*;
- Events in each member country such as lecture series;
- Special scientific sessions at the 25th Anniversary Annual Meeting (PICES-2016) that reflect on the progress in key areas germane to PICES, and a session devoted to the next 25 years of marine science in the North Pacific;
- Development of a 25th anniversary logo that would be on all PICES communications during the anniversary year.

Membership

The membership of the Committee includes: Chairman of the Finance and Administration (F&A) Committee, Chairman and Vice-Chairman of Science Board, Executive Secretary, and a representative from each of the Contracting Parties.

Visiting Scientist Program (approved on October 20, 2012)

Rationale

Scientific activities sponsored and/or conducted by PICES have increased significantly since its inception in 1992, as has its production of scholarly works. Growth was achieved by making efficient use of national contributions and by attracting external funding for PICES activities. In addition, the new PICES FUTURE Scientific Program, which began in 2009, will require a great deal of scientific involvement, oversight, and collaboration in order to be successful. This will involve the need to deliver timely, high quality scientific products to the PICES community and beyond. PICES is seeking ways to enhance the ability of the Organization and the Secretariat to support the increasing demand. Establishing a PICES Visiting Scientist Program will allow national agencies and/or other international science organizations to contribute “in kind” toward achieving PICES goals, and improve the way the Organization functions.

Objectives of the program

- to provide for and enhance collaborative projects among PICES member countries;
- to strengthen the capacity of the Organization to develop and implement projects that have high priority for PICES and member countries, particularly those linked to integrative science programs of PICES;
- to provide professional development of marine scientists and managers from PICES member countries.

Nature of the program

Each visiting scientist (expert) will be made available to PICES through secondments from national agencies and/or other international science organizations. He/she will be given a specific task that is important to PICES and is also in the interests of his/her agency/organization. The secondment should be governed by a mutual agreement developed between PICES and the seconding agency/organization. The agreement spells out the terms of reference for the tasks, responsibilities, duration, as well as the legal terms.

The expert will perform the given task either at the PICES Secretariat, at their home institution, or at an institution of another PICES country that has agreed to host the expert, while the expert remains on the payroll of his/her agency/organization. The expert’s agency/organization shall pay the salary, allowances, and expenses incurred in travel to and from the place of residence and the location of the secondment. Since the

expert will continue to be an employee of his agency/organization while working on their collaborative project, his/her expenses relating to taxes, medical and life insurance coverage, and any other benefits to which the expert is entitled, will remain the responsibility of his/her agency/organization.

PICES or the hosting institution shall provide appropriate facilities, including office space and administrative services. Travel expenses associated with the expert's work under the collaborative project will be shared by PICES or the hosting agency and the expert's agency/organization as agreed upon in the MOU.

Qualification

The expert should be an experienced individual (Ph.D. or master's level scientist with over 5 years of post-master's degree experience) with good scientific writing and oral communication skills in English. The particular qualifications will depend on the tasks outlined for the collaborative project.

Duration and starting date

The program will be implemented following approval by the Governing Council and identification of potential tasks by the Science Board. The expert's term will start after approval of the specific MOU. Duration of the term will depend on the specific task. The expert may be onsite for as little as two weeks to as long as visa requirements allow. Applicants may have already identified a host institution or PICES will help identify hosts.

Information required from potential host institutions

Institutions interested in hosting a PICES Visiting Scientist should provide the following information, in a short proposal describing the visiting scientist's term at the host institution:

- Help requested: mentoring in research, technology assistance, teaching, *etc.*
- Term of service desired, including specific dates
- Local subsistence provided
- Language abilities desired
- Plans by the host institution to build on the training received or assistance provided.

Study Group on Radionuclide Science in the North Pacific Ocean (SG-RS)

Parent Committee: Science Board

Duration: 1 year

Terms of Reference (*approved* on October 21, 2012)

6. To convene a workshop in China to provide a forum for exchange of views among scientists on the idea of developing a scientific focus on understanding the quantities and distributions of radionuclides in the North Pacific;
7. To refine the terms of reference for the Working Group on *Assessment of Marine Environmental Quality of Radiation around the North Pacific* proposed by China in consideration of wider interests of scientists in PICES member countries, including relevance to the FUTURE/AICE mandate;
8. To develop a list of potential Working Group members;
9. To prepare a report with recommendations for future PICES activities and products related to the topic that are consistent with the new MEQ Action Plan;
10. To make the final report available by the inter-sessional Science Board meeting in May 2013.

GC Appendix A

2012 Governing Council decisions

2012/A/1: Auditor

- i. Council accepted the audited accounts for *FY* 2011.
- ii. Council authorized the Executive Secretary to sign a new 3-year contract (for *FYs* 2012-2014) with the current auditor *Flader, Hale & Hughesman*.

2012/A/2: Annual contributions

- i. Council re-iterated that for planning of their funding requests for annual contributions, Contracting Parties should continue to use the guideline generally accepted at PICES-1999 (Decision 1999/A/2(ii)), which states that the annual contributions will increase at the rate of inflation in Canada.
- ii. Council instructed the Executive Secretary to send a letter to the Contracting Parties regarding the need for timely payment of the annual contribution and describing the difficulties that late and/or partial payment causes the Organization.

2012/A/3: Budget and fund-raising

- i. Council accepted the estimated accounts for *FY* 2012.
- ii. Council approved the *FY* 2013 budget of \$850,000. The amount of \$113,620 will be transferred from the Working Capital Fund to balance the budget, setting the total annual contribution at \$736,800, and the 2013 annual fee at \$122,800 per Contracting Party.
- iii. Council approved a transfer from the Working Capital Fund to the Relocation and Home Leave Fund in order to bring the balance of this fund to \$100,000.
- iv. Council approved a transfer from the Working Capital Fund to the Trust Fund to recover the 2012 expenses, and to restore the Trust Fund to the level of \$110,000. This transfer will include \$11,870 from the amount remaining in the PICES-2010 Annual Meeting fund.
- v. Council agreed that the available balance of funds in the Working Capital Fund as of December 31, 2012, from the 2011 Zooplankton Production Symposium and 2012 PICES/ICES Conference for Early Career Scientists be allocated for the development of the PICES integrative science program on “*Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Ecosystems*” (FUTURE).
- vi. Council approved a lump sum employer contribution of \$20,000 from the *FY* 2013 budget and an additional lump sum payment from a *FY* 2012 surplus in the General Fund to the International Fisheries Commission Pension Plan to pay down unfunded liabilities.

2012/A/4: Future PICES Annual Meetings and 2013 inter-sessional Science Board meeting

- i. Considering that PICES-2012 was the first Annual Meeting for which the structure was in accordance with the entire suite of recommendations by the Study Group on *Restructuring of the PICES Annual Meeting* (SG-RAM), Council decided to discuss the effectiveness of the approved changes in the format of the Annual Meeting at PICES-2013.
- ii. Council approved the theme description, “*Communicating forecasts, uncertainty and consequences of ecosystem change to society*”, for PICES-2013 to be held from October 11-20, 2013, in Nanaimo, British Columbia, Canada.
- iii. Council requested an answer from China by the end of November 2012, regarding its ability to host PICES-2014, and agreed to consider the following options if China is unable to host PICES-2014: (1) asking Korea if it might be prepared to host PICES-2014 and give China the opportunity to host PICES-2015, (2) holding PICES-2014 at the seat of the Secretariat, or (3) merging the FUTURE Open Science Meeting and PICES-2014.
- iv. Assuming that China agrees to host PICES-2014, Council, following the established 6-year rotation cycle, requested Korea to explore the possibility of hosting PICES-2015, and inform the Secretariat on this matter by March 31, 2013.

- v. Council agreed to keep the same registration fee structure for PICES-2013 as for PICES-2010 through PICES-2012:

Type of registration fee	CDN \$
Regular	275
Early	200
Student	50
Spousal/guest	50

- vi. Council approved an inter-sessional Science Board meeting to be held May 20–21, 2013, immediately prior to a 3-day joint PICES/ICES FUTURE-related workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*” to be convened May 22–24, 2013. Both events are to be hosted by Russia in St. Petersburg.

2012/A/5: Twenty-Fifth Anniversary of PICES

Council approved the formation of a planning committee for the twenty-fifth anniversary of PICES, consisting of the Chairman of the Finance and Administration (F&A) Committee, Chairman and Vice-Chairman of Science Board, Executive Secretary, and a representative from each of the Contracting Parties. The group’s responsibility would be to direct the planning of activities, budget and fund-raising for this celebration. Council instructed the F&A Committee Chairman to draft the terms of reference for the group (see *GC Appendix B*).

2012/A/6: PICES Visiting Scientist Program

Council approved the revised description of the PICES Visiting Scientist Program (see *GC Appendix B*) and instructed the Executive Secretary to send a letter to the Contracting Parties, requesting their proposals for contributions to the Program.

2012/A/7: PICES Intern Program

- i. Considering funding currently available for the Intern Program and stated intentions for contributions by Contracting Parties, Council agreed to extend the period of appointment for the 2012 intern, Dr. Zhuojun Ma (China), to a possible maximum of 12 months, and to initiate the process to obtain the 2013 intern, with the understanding that the intern’s term will start no earlier than July 2013. Following the existing rotation cycle, Russia was requested to nominate the intern by January 31, 2013.
- ii. Council instructed the Executive Secretary to invite Contracting Parties to provide voluntary contributions to the Trust Fund to support the Intern Program in 2013 and beyond.

2012/A/8: World Ocean Assessment (UN Regular Process for Global Reporting and Assessment of the State of the Marine Environment)

Council pointed out the importance of facilitating the conduct of the World Ocean Assessment and agreed to:

- (1) encourage individuals in the PICES network to join the *Pool of Experts*, the body from which the *Group of Experts* will select authors and reviewers of the first World Ocean Assessment;
- (2) promote the development of North Pacific workshop(s) to enable incorporation of regional knowledge into the first World Ocean Assessment report;
- (3) consider means by which PICES products are visible in the World Ocean Assessment.

2012/A/9: Improvement of participation in PICES activities

- i. In order to better assess problems existing in Contracting Parties with the participation of their scientists in the activities of the Standing Committees and their subsidiary bodies, and in the Annual Meetings of the Organization, Council instructed the Executive Secretary to continue regularly preparing and circulating to Contracting Parties information on participation of their scientists in the Annual Meetings.
- ii. Council re-iterated the necessity for Contracting Parties to: (1) regularly review their national membership, and to provide the updated national membership list to the Secretariat by the first day of the calendar year (January 1), and (2) follow up on *Rule 1(ii)* of the PICES Rules of Procedure in providing the national delegation list for Annual Meetings.

2012/A/10: Election of Chairman and Vice-Chairman

- i. Dr. Laura Richards (Canada) was unanimously elected as the Chairman of PICES for a 2-year term (2012–2014) to replace Dr. Lev Bocharov (Russia). As Dr. Bocharov will resume his duties as the Russian national delegate, Council agreed that Dr. Tokio Wada (Japan) will continue to serve as the Past-Chairman.
- ii. Dr. Chul Park (Korea) was unanimously elected as the Vice-Chairman of PICES for a 2-year term (2012–2014) to replace Dr. Laura Richards.

2012/A/11: Appointment of F&A Committee Chairman

Dr. John Stein (U.S.A.) was appointed as the Chairman of the F&A Committee for a 2-year term (2012–2014).

2012/A/12: PICES Secretariat

- i. Council extended the term of the Executive Secretary until December 31, 2014;
- ii. Council agreed to consider a complex of issues related to the structure and staffing of the Secretariat at PICES-2013 and, in preparation for this discussion, directed the F&A Chairman to work with the Executive Secretary over the next year to (1) prepare position descriptions for both the Executive Secretary and the Deputy Executive Secretary, (2) develop the process and timeline for staffing the Deputy Executive Secretary position, and (3) review the organizational structure and salary budget of the Secretariat.

2012/S/1: PICES Integrative Science Program, FUTURE

- i. Council approved activities and timelines for FUTURE (FUTURE roadmap) proposed by Science Board, with the addition of a footnote to the suggested timeline of delivering the next edition of the North Pacific Ecosystem Status Report (NPESR-3), stating “under the condition that NPESR-2 is fully completed”.
- ii. Council requested that the Executive Secretary send a letter to the Contracting Parties providing information on planned activities for FUTURE and requesting contributions to these activities, particularly for the 2014 FUTURE Open Science Meeting.

2012/S/2: 2013 PICES Annual Meeting

- i. The following scientific sessions are to be convened at PICES-2013:
 - ¾-day Science Board Symposium on “*Communicating forecasts, uncertainty and consequences of ecosystem change to society*”;
 - 1-day BIO Contributed Paper Session;
 - 1-day BIO/FIS Topic Session on “*Marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being*”;
 - ½-day BIO/FIS/POC Topic Session on “*Are marine ecosystems of the North Pacific becoming more variable?*”;
 - 1-day BIO/FIS/MEQ/TCODE/FUTURE Topic Session on “*Ecosystem indicators to characterize ecosystem responses to multiple stressors in North Pacific marine ecosystems*”;
 - 1-day BIO/POC/MONITOR/TCODE/FUTURE Topic Session on “*Recent trends and future projections of North Pacific climate and ecosystems*”;
 - 1-day FIS Contributed Paper Session;
 - 1-day FIS/FUTURE Topic Session on “*Science needs for offshore oil and gas development in the North Pacific*”;
 - 1-day FIS/TCODE Topic Session on “*Banking on recruitment curves; returns on intellectual investment*”;
 - ½-day MEQ Contributed Paper Session;
 - ½-day MEQ/FUTURE Topic Session on “*Status, trends and effects of pollutants in coastal ecosystems: Implications for wildlife and humans*”;
 - 1-day MONITOR Topic Session on “*Towards the development of low-cost cooperative ocean monitoring networks* [the title was changed to “*Cost-effective, cooperative ocean monitoring*”];

- 1-day POC Contributed Paper Session;
 - 1-day POC Topic Session on “*The changing carbon cycle of North Pacific continental shelves and marginal seas*”.
- ii. The following workshops are to be convened at PICES-2013:
- 1-day PICES/ICES Workshop on “*Comparison of size-based and species based ecosystem models*”;
 - 1-day PICES/ICES Workshop on “*Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and "data dreams" for the future*”;
 - 1-day BIO Workshop on “*Marine bird and mammal spatial ecology*”;
 - ½-day MEQ Workshop on “*The economic impacts of harmful algal blooms on fisheries and aquaculture*”;
 - 1-day MEQ Workshop on “*Traditional seafoods of coastal aboriginal communities in the North Pacific: Insight into food, social and ceremonial uses at Snuneymux’w First Nation in Nanaimo, British Columbia*”;
 - 1-day TCODE Workshop on “*Tools, approaches and challenges for accessing and integrating distributed datasets*”;
 - 1-day FUTURE Workshop on “*Evaluating tools for assessment of species vulnerability to anthropogenic climate change*”.
- iii. The following business meetings are to be held at PICES-2013:
- ¼-day Science Board (SB) meeting (October 13) and 1½-day SB meeting (October 18 afternoon and October 19);
 - 1½-hour overture meetings (October 13 evening) and ½-day meetings of Scientific and Technical Committees (October 16 afternoon);
 - 1-day meeting of the SB Section on *Human Dimensions of Marine Systems*;
 - ½-day meeting of the BIO/FIS/POC Section on *Climate Change Effects on Marine Ecosystems*;
 - 1-day meeting of the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific*;
 - ½-day meeting of the POC/BIO Section on *Carbon and Climate*;
 - 1-day meeting of the MEQ Working Group on *Non-indigenous Aquatic Species*;
 - 1-day meeting of the BIO Working Group on *Jellyfish Blooms around the North Pacific Rim*;
 - ¾-day meeting of the POC Working Group on *North Pacific Climate Variability and Change*;
 - 1-day meeting of the MEQ/BIO Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors*;
 - ½-day meeting of the POC Working Group on *Regional Climate Modeling*;
 - 1-day meeting of the BIO Advisory Panel on *Marine Birds and Mammals*;
 - ½-day meeting of the POC/MONITOR Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas*;
 - ½-day meeting of the MONITOR Advisory Panel on the *Continuous Plankton Recorder Survey in the North Pacific*;
 - 1-day meeting of the MEQ Study Group on *Marine Pollutants*;
 - ½-day concurrent meetings of the FUTURE Advisory Panels on *Anthropogenic Influences on Coastal Ecosystems, Climate, Oceanographic Variability and Ecosystems* and *Status, Outlooks, Forecasts, and Engagement*, preceded by a ½-day joint meeting of these Panels.

2012/S/3: Inter-sessional symposia/sessions/workshops/meetings

The following inter-sessional events are to be convened/co-sponsored in 2013 and beyond:

- i. Symposia/conferences:
- International Symposium on “*Climate variability and change on marine resources and fisheries: Toward a South Pacific Integrated Ecosystem Studies Program (SPICES)*”, January 7–10, 2013, Concepción, Chile (co-sponsored by PICES);
 - IMBER IMBIZO III on “*The future of marine biogeochemistry, ecosystems and societies: Multi-dimensional approaches to the challenges of global change in continental margins and open ocean systems*”, January 28–31, 2013, Goa, India (co-sponsored by PICES);
 - 4th International Jellyfish Bloom Symposium, June 5–7, 2013, Hiroshima, Japan (co-sponsored by PICES);

- 8th International Conference on Marine Bioinvasions, August 20–22, 2013, Vancouver, Canada (co-sponsored by PICES);
 - 1st FUTURE Open Science Meeting, April 2014, Honolulu, U.S.A.;
 - ICES Symposium on “*Ecological basis of risk analysis for marine ecosystems*”, June 2–6, 2014, Helsinki, Finland (co-sponsored by PICES);
 - 3rd International Symposium on “*Effects of climate change on the world’s oceans*”, spring 2015, Brazil (primary international sponsors: PICES, ICES and IOC).
- ii. Joint Theme Sessions:
- CLIVAR/PICES Theme Session on “*Biophysical interactions*” at the 2nd International Symposium on “*Boundary Current dynamics: Its connection with open-ocean, coastal processes, biophysical interactions and responses to global climate change*”, July 8–13, 2013, Lijiang, China;
 - ICES/PICES Theme Sessions on “*Marine litter*” (Session A), “*Responses of living marine resources to climate change and variability: Learning from the past and projecting the future*” (Session B), “*Do food web dynamics matter in fisheries management?*” (Session E), and “*Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for the future*” (Session M), at the 2013 ICES Annual Science Conference, September 23–27, 2013, Reykjavik, Iceland.
- iii. Workshops and meetings:
- 2-day workshop to exchange views on the idea of developing a scientific focus within PICES on understanding the quantities and distributions of radionuclides in the North Pacific, March 2013, Xiamen, China;
 - 5-day PICES/ICES/GEOHAB workshop on “*Harmful algal blooms in a changing world*”, March 18–22, 2013, Friday Harbor, WA, U.S.A.;
 - 2-day inter-sessional Science Board meeting, May 20–21, 2013, St. Petersburg, Russia;
 - 3-day PICES/ICES workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*”, May 22–24, 2013, St. Petersburg, Russia;
 - 1-day inter-sessional meeting of the Working Group on *Jellyfish Blooms around the North Pacific Rim* prior to the 4th International Jellyfish Bloom Symposium, June 4, 2013, Hiroshima, Japan;
 - 3-day workshop on “*Development and application of Regional Climate Models-II*”, September 3–5, 2013, Busan, Korea.
- iv. Capacity development events:
- PICES Summer School on “*Ocean observing systems and ecosystem monitoring*”, August 19–23, 2013, Hatfield Marine Science Center, Newport, U.S.A.
 - 6th SOLAS Summer School, August 23–September 2, 2013, Xiamen, China (co-sponsored by PICES);
 - NOWPAP/PICES training course on “*Remote sensing data analysis*”, fall 2013, Qingdao, China;
 - 2014 PICES Summer School on “*Ecological modeling*”, August 18–21, 2014, Seoul, Korea.

2012/S/4: Travel and representation at the meetings of other organizations/programs

- i. 2013 PICES Annual Meeting:
- Invited speakers for Science Board Symposium and Topic Sessions, with the normal allocation of approximately \$5,000 per Committee/Program; additional requests are subject to fund availability;
 - One invited speaker for each of the approved workshops (see 2012/S/2(ii)).
- ii. Inter-sessional events:
- PICES representative to participate in the ESSAS (Ecosystem Studies of Sub-Arctic Seas) Annual Meeting on “*Climate Effects on Spatial Dynamics of Sub-Arctic and Arctic Marine Ecosystems*” and the ESSAS Scientific Steering Committee Meeting (January 7–11, 2013, Hakodate, Japan);
 - PICES representative(s) to attend the 22nd Session of IODE (International Oceanographic Data and Information Exchange) of IOC-UNESCO (March 11–15, 2013, Ensenada, Mexico);
 - PICES representative to attend the NPAFC CSRS (Committee on Scientific Research and Statistics) meeting (April 23–24, 2013, Honolulu, U.S.A.);
 - PICES representative to participate in the 27th Session of the IOC (Intergovernmental Oceanographic Commission of UNESCO) Assembly (June 2013, Paris, France);

- PICES representative to give a seminar at the ISC (International Scientific Committee for Tuna and Tuna-like Species) Annual Meeting (July 17–22, 2013, Busan, Korea) focusing on environmental data availability and modeling capabilities and possible techniques for incorporating this information into ISC stock assessments;
- PICES representatives and convenors for the joint Theme Sessions to participate in the ICES Annual Science Conference (September 23–27, 2013, Reykjavik, Iceland);
- PICES representative to attend the SCOR (Scientific Committee on Oceanic Research) Executive Committee Meeting (November 25–28, 2013, New Zealand);
- PICES representative to participate in the 18th NOWPAP (Northwest Pacific Action Plan) Intergovernmental Meeting (TBD).

2012/S/5: Publications

- i. The following publications are to be produced in or submitted to primary journals in 2013:
 - Special issue of *ICES Journal of Marine Science* based on selected papers from the 2nd International Symposium on “*Effects of climate change on the world’s oceans*” to be published in 2013;
 - Special issue of *Progress in Oceanography* on modeling dedicated to Dr. Bernard Megrey (Guest Editors: E. Curchitser and S.I. Ito) to be published in 2013;
 - Special issue of *Progress in Oceanography* based on selected papers from the 2012 Topic Session on “*Advances in understanding the North Pacific Subtropical Frontal Zone ecosystem*” (Guest Editors: T. Ichii, S. McKinnell and M. Seki) to be submitted in 2013;
 - Special issue of *Journal of Fishery Science* based on selected papers from the 2012 Topic Session on “*Social-ecological systems on walley Pollock and other commercial gadids under changing environment: Inter-disciplinary approach*” (Guest Editors: K. Criddle, S. Kim, M. Makino, I. Perry, Y. Sakurai and A. Velikanov) to be submitted in 2013;
 - Review paper in a peer-reviewed journal based on the results from the 2013 PICES/ICES/GEOHAB workshop on “*Harmful algal blooms in a changing world*” to be submitted in 2013;
 - Set of papers in a peer-reviewed journal based on the results from the 2013 PICES/ICES workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*” to be submitted in 2013.
- ii. The following publications are to be produced in the PICES Scientific Report series in 2013:
 - Final Report of the Working Group 21 on *Non-indigenous Aquatic Species* (Editors: D. Smith and T. Theriault);
 - Final Report of the Working Group 23 on *Comparative Ecology of Krill in Coastal and Oceanic Waters Around the Pacific Rim* (Editors: W. Peterson and T. Shaw);
 - Final report of the Working Group 24 on *Environmental Interactions of Marine Aquaculture* (Editors: K. Abo, B. Dumbauld and S. Johnson);
 - Final report of the Study Group on *Marine Pollutants* (Editor: P. Ross);
 - Report of the 2012 GLOBEC/PICES/ICES Workshop on “*Forecasting ecosystem indicators with process-based models*” (Editors: E. Di Lorenzo, A. Miller and S. Minobe);
 - Final report for the Climate Change and Carrying Capacity Program (Editor: H. Batchelder).
- iii. Other publications to be produced in 2013 include:
 - Announcement, poster and Book of Abstracts for PICES-2013 (October 12–21, 2013, Nanaimo, Canada);
 - Two regular issues of PICES Press to be published on the website and distributed electronically in January (Vol. 21, No. 1) and July (Vol. 21, No. 2) of 2013;
 - PICES E-news to be published on the website and distributed electronically (4 issues per year).

2012/S/6: Future of current PICES expert groups

- i. The FIS/MEQ Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24) completed the terms of reference and will be disbanded.
- ii. To allow the development of a proposal for future activities on non-indigenous species within PICES, the life span of the MEQ Working Group on *Non-indigenous Aquatic Species* (WG 21) was extended for 1 year (until October 2013).

- iii. To allow the development of a proposal for future activities on marine pollutants within PICES, the life span of the MEQ Study Group on *Marine Pollutants* (SG-MP) was extended for 1 year (until October 2013).
- iv. Changes in the terms of reference for the MEQ Section on *Ecology of Harmful Algal Blooms in the North Pacific* (S-HAB) are to be discussed at ISB-2013 under the revised MEQ Action Plan.

2012/S/7: New PICES expert groups

Following the process decided by Council at PICES-2012, a Study Group on *Radionuclide Science in the North Pacific Ocean* (SG-RS) was established under the direction of Science Board, with terms of reference as described in *GC Appendix B*.

2012/S/8: Chairmanship and membership for Science Board, Standing Committees and expert groups

- i. To facilitate the continuity of Science Board affairs, Council established a Science Board Chairman-elect position to allow the election of the Chairman of Science Board one year before the official change of the chairmanship (Decision 2006/A/11). Dr. Thomas Therriault (Canada) was unanimously elected for this position.
- ii. The following reflects changes in Chairmanship and Vice-Chairmanship for Standing Committees:
 - Mr. Chuanlin Huo (China) was elected as the Chairman of MEQ to replace Dr. Steven Rumrill (U.S.A.);
 - Ms. Darlene Smith (Canada) was elected as the Vice-Chairman of MEQ to replace Dr. Mitsutaku Makino (Japan);
 - Dr. Phillip Mundy (U.S.A.) was approved as the Chairman of AP-SOFE to replace Mr. Robin Brown (Canada).

2012/S/9: Relations with other organizations and programs

Council approved the revised *Standing List of International and Regional Organizations and Programs* and agreed with the identified priorities for interaction in 2012–2013 (see *GC Appendix B*).

GC Appendix B

PICES 25th Anniversary Planning Committee

The 25th anniversary of the North Pacific Marine Science Organization (PICES) is on the horizon (the 25th Anniversary Annual Meeting will be held in 2016) and is worthy of celebration, reflection and looking forward. PICES was established in 1992 to promote and coordinate marine scientific research in the northern North Pacific and adjacent seas, and has made significant contributions to this mission through its scientific programs and other activities. The 25th Anniversary of PICES provides an important opportunity for the Organization and its member countries to recognize the accomplishments to date and to look forward to the next 25 years.

The formation of a Planning Committee for the 25th Anniversary of PICES was approved at the 2012 PICES Annual Meeting.

Terms of Reference

1. To direct the planning of events, activities and products for the PICES 25th Anniversary year that:
 - a. summarize the scientific accomplishments and advancements to date that are related to marine science in the North Pacific;
 - b. promote and highlight both the scientific importance of PICES accomplishments and associated benefits to member countries;
 - c. provide an opportunity to look forward to future advancements in marine science in the next 25 years.
2. To prepare the budget and plan fund-raising activities for the PICES 25th Anniversary year;
3. To report annually to F&A and GC on progress, with final recommendations and associated financial implications due for presentation at PICES-2014.

Examples of activities and products to be considered include:

- Web products such as: a 25th anniversary photo album highlighting people and events over PICES history, interactive historical timeline of PICES, video of PICES accomplishments, 25 photos that depict 25 years of PICES, *etc.*;
- Publications such as: a 25th anniversary edition of PICES news and a special journal issue that highlights the science advancements of PICES and future of marine science in the North Pacific;
- Events such as: a 25th anniversary gala with invited dignitaries and scientists from PICES history and key partners, including ICES, IOC, SCOR, *etc.*;
- Events in each member country such as lecture series;
- Special scientific sessions at the 25th Anniversary Annual Meeting (PICES-2016) that reflect on the progress in key areas germane to PICES, and a session devoted to the next 25 years of marine science in the North Pacific;
- Development of a 25th anniversary logo that would be on all PICES communications during the anniversary year.

Membership

The membership of the Committee includes: Chairman of the Finance and Administration (F&A) Committee, Chairman and Vice-Chairman of Science Board, Executive Secretary, and a representative from each of the Contracting Parties.

Visiting Scientist Program (approved on October 20, 2012)

Rationale

Scientific activities sponsored and/or conducted by PICES have increased significantly since its inception in 1992, as has its production of scholarly works. Growth was achieved by making efficient use of national contributions and by attracting external funding for PICES activities. In addition, the new PICES FUTURE Scientific Program, which began in 2009, will require a great deal of scientific involvement, oversight, and collaboration in order to be successful. This will involve the need to deliver timely, high quality scientific products to the PICES community and beyond. PICES is seeking ways to enhance the ability of the Organization and the Secretariat to support the increasing demand. Establishing a PICES Visiting Scientist Program will allow national agencies and/or other international science organizations to contribute “in kind” toward achieving PICES goals, and improve the way the Organization functions.

Objectives of the program

- to provide for and enhance collaborative projects among PICES member countries;
- to strengthen the capacity of the Organization to develop and implement projects that have high priority for PICES and member countries, particularly those linked to integrative science programs of PICES;
- to provide professional development of marine scientists and managers from PICES member countries.

Nature of the program

Each visiting scientist (expert) will be made available to PICES through secondments from national agencies and/or other international science organizations. He/she will be given a specific task that is important to PICES and is also in the interests of his/her agency/organization. The secondment should be governed by a mutual agreement developed between PICES and the seconding agency/organization. The agreement spells out the terms of reference for the tasks, responsibilities, duration, as well as the legal terms.

The expert will perform the given task either at the PICES Secretariat, at their home institution, or at an institution of another PICES country that has agreed to host the expert, while the expert remains on the payroll of his/her agency/organization. The expert’s agency/organization shall pay the salary, allowances, and

expenses incurred in travel to and from the place of residence and the location of the secondment. Since the expert will continue to be an employee of his agency/organization while working on their collaborative project, his/her expenses relating to taxes, medical and life insurance coverage, and any other benefits to which the expert is entitled, will remain the responsibility of his/her agency/organization.

PICES or the hosting institution shall provide appropriate facilities, including office space and administrative services. Travel expenses associated with the expert's work under the collaborative project will be shared by PICES or the hosting agency and the expert's agency/organization as agreed upon in the MOU.

Qualification

The expert should be an experienced individual (Ph.D. or master's level scientist with over 5 years of post-master's degree experience) with good scientific writing and oral communication skills in English. The particular qualifications will depend on the tasks outlined for the collaborative project.

Duration and starting date

The program will be implemented following approval by the Governing Council and identification of potential tasks by the Science Board. The expert's term will start after approval of the specific MOU. Duration of the term will depend on the specific task. The expert may be onsite for as little as two weeks to as long as visa requirements allow. Applicants may have already identified a host institution or PICES will help identify hosts.

Information required from potential host institutions

Institutions interested in hosting a PICES Visiting Scientist should provide the following information, in a short proposal describing the visiting scientist's term at the host institution:

- Help requested: mentoring in research, technology assistance, teaching, *etc.*
- Term of service desired, including specific dates
- Local subsistence provided
- Language abilities desired
- Plans by the host institution to build on the training received or assistance provided.

Study Group on Radionuclide Science in the North Pacific Ocean (SG-RS)

Parent Committee: Science Board

Duration: 1 year

Terms of Reference (*approved* on October 21, 2012)

1. To convene a workshop in China to provide a forum for exchange of views among scientists on the idea of developing a scientific focus on understanding the quantities and distributions of radionuclides in the North Pacific;
2. To refine the terms of reference for the Working Group on *Assessment of Marine Environmental Quality of Radiation around the North Pacific* proposed by China in consideration of wider interests of scientists in PICES member countries, including relevance to the FUTURE/AICE mandate;
3. To develop a list of potential Working Group members;
4. To prepare a report with recommendations for future PICES activities and products related to the topic that are consistent with the new MEQ Action Plan;
5. To make the final report available by the inter-sessional Science Board meeting in May 2013.

2012-2013 Standing List of International and Regional Organizations and Programs

ACIA	Arctic Climate Impact Assessment Program (ACIA of AMAP)
AFSCAR	American Fisheries Society Program on Climate and Aquatic Resources
AMAP	Arctic Monitoring and Assessment Program

AOOS*	Alaska Ocean Observing System
APEC-MRC	Marine Resources Conservation Working Group, Asia Pacific Economic Cooperation
APEC-FWG	Fisheries Working Group, Asia Pacific Economic Cooperation
APFIC	Asia-Pacific Fisheries Commission
APN	Asia Pacific Network for Global Change Research
Argo*	International Program for deployment of profiling floats
BEST-BSIERP*	Bering Sea Ecosystem Study
CeNCOOS	Central and Northern California Ocean Observing System
CERF	Coastal and Estuarine Research Federation
CLIVAR*	Climate Variability and Predictability Program
ESSAS*	Ecosystem Studies of Sub-Arctic Seas
EVOSTC	<i>Exxon Valdez</i> Oilspill Trustee Council
FAO	Food and Agriculture Organization
GESAMP	Group of Experts on Scientific Aspects of Marine Pollution
GOOS*	Global Ocean Observing System
IAMSLIC	International Association of Marine Science Libraries
IASC	International Arctic Science Committee
IATTC	Inter-American Tropical Tuna Commission
ICES*	International Council for the Exploration of the Sea
IGBP	International Geosphere-Biosphere Program
IHDP	International Human Dimensions Programme on Global Environmental Change
IMBER*	Integrated Marine Biogeochemistry and Ecosystems Research
IMO	International Maritime Organization
IOC*	Intergovernmental Oceanographic Commission
IOCCP*	International Ocean Carbon Coordinated Project
IODE	International Oceanographic Data and Information Exchange
IPCC*	Intergovernmental Panel on Climate Change
IPHC	International Pacific Halibut Commission
ISC	International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean
IWC	International Whaling Commission
NAFO	Northwest Atlantic Fisheries Organization
NANOOS	Northwest Association of Networked Ocean Observing Systems System
NEAR-GOOS*	North East Asian Regional GOOS
NOWPAP*	Northwest Pacific Action Plan
NPAFC*	North Pacific Anadromous Fish Commission
NPFMC	North Pacific Fishery Management Council
NPRB*	North Pacific Research Board
PaCOOS*	Pacific Coast Observing System
PAG	Pacific Arctic Group
POGO	Partnership for Observing the Global Oceans
PSC	Pacific Salmon Commission
PSG	Pacific Seabird Group
SAHFOS*	Sir Alister Hardy Foundation for Ocean Science
SAON	Sustaining Arctic Observing Networks
SCCOOS	Southern California Coastal Ocean Observing System
SCOPE	Scientific Committee on Problems of the Environment
SCOR*	Scientific Committee on Oceanic Research
SOLAS*	Surface Ocean Low Atmosphere Study
SPC	South Pacific Commission
SPREP	South Pacific Regional Environmental Program
START	South Asian Regional Committee for the System for Analysis, Research and Training
UNEP	United Nations Environment Program

WCPFC Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
WCRP World Climate Research Programme
WESTPAC* Cooperative Study of the Western Pacific, IOC Sub Committee for the Western Pacific
WPFMC Western Pacific Fishery Management Council

Finance and Administration Committee

The Finance and Administration (hereafter F&A) Committee met from 09:00–12:30 hours on October 17, 2012, under the chairmanship of Ms. Patricia Livingston.

AGENDA ITEM 1

Opening remarks

The Chairman called the meeting to order, welcomed the participants and requested an introduction of members for each delegation. All Contracting Parties were present at the meeting (*F&A Endnote 1*).

AGENDA ITEM 2

Adoption of agenda

The Committee reviewed and approved the provisional agenda without modification (*F&A Endnote 2*).

AGENDA ITEM 3

Audited accounts for FY 2011

The FY 2011 financial statements were submitted to *Flader, Hale & Hughesman* (PICES external auditor for FYs 2009–2011) on March 26, 2012, and the Auditor's Report was completed on May 3, 2012. The report (*F&A Endnote 3*) was electronically circulated to all Contracting Parties on May 4, 2012. In the auditor's opinion, "*the financial statements are an accurate representation of the financial position of the Organization as of December 31, 2011, and the results of its operations and changes in the fund balances for the year then ended*". The Committee noted that the auditing process was in line with the PICES Financial Regulations (*Regulation 11(ii)* and *Regulation 13*) and recommended that the Auditor's Report be approved by Governing Council (hereafter Council).

The Committee also discussed the external auditor for FYs 2012–2014 and recommended that Council authorize the Executive Secretary to sign a new 3-year contract with the current auditor, given their familiarity with PICES operations.

AGENDA ITEM 4

Annual contributions

As stated in *Regulation 5(ii)* of the PICES Financial Regulations, all national contributions to PICES "*shall be considered due as of the first day of the financial year (January 1) to which they relate*". The Executive Secretary pointed out that a letter commending Contracting Parties for their performance in submitting annual contributions for FY 2011, and describing difficulties that late and/or partial payment causes the Organization (Decision 2011/A/2(i)) was sent on October 31, 2011, simultaneously with a request for payment of the 2012 annual fees. He also reported on the 2012 annual fee payment dates, and provided information on the payment of national contributions for the period from 2005 to 2012 (*F&A Endnote 4*). The Committee noted that all Contracting Parties met their financial obligations for FY 2012. Although the payment schedule of the parties appeared to be stable the last few years, this does not appear to be the case this year. The Committee recommends that Council direct the Executive Secretary to send a letter to the Contracting Parties with respect to this matter, encouraging the timely payment of their annual fees.

The Committee confirmed its previous recommendation that for planning purposes, Contracting Parties should continue to use the guideline generally accepted at PICES-1999 (Decision 1999/A/2(ii)), which states that "*the*

F&A-2012

annual contributions will increase at the rate of inflation in Canada". This should assist Contracting Parties in preparing timely funding requests to cover annual contributions, and assist the Executive Secretary in developing future budgets. As the Committee discussed and recommended in 2011, the method for computing the Consumer Price Index (CPI) is to use the average of the monthly values from July of the previous year to June of the current year for determining the rate of increase in the future.

AGENDA ITEM 5

Fund-raising activities

Annual contributions increasing only at the rate of inflation in Canada can impede improvement and development of the Organization. Therefore, fund-raising continues to be an important component of PICES activities. All types of contributions are equally valuable to PICES.

The level of external funding has increased significantly over the last several years. In 2010 and 2011, the amount of funds from voluntary contributions, grants, and partnerships for various activities initiated or sponsored by PICES exceeded the total annual contributions by Contracting Parties. This will also occur in 2012, indicating the Organization's large dependence on outside funding, most of which have specific product and service requirements.

The Executive Secretary reported on fund-raising efforts for the period since PICES-2011 (*F&A Endnote 5*). With respect to the North Pacific Continuous Plankton Recorder (NP CPR) survey, it was noted that the program appears to have relatively secure funding until 2013 and some funding available into 2016. It was also indicated that the annual report on the program's achievements is useful to Contracting Parties as they seek to obtain continued funding for this activity. The *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) and Japan Society for Promotion of Science (JSPS) extended their participation in the PICES consortium until 2016, with the same level of funding as for 2009–2013. The next critical renewals are those of Canada's Department of Fisheries and Oceans and the North Pacific Research Board (NPRB). Canada indicated intent to continue providing their support. There will be an NPRB call for long-term monitoring pre-proposals in June 2013, and PICES should be prepared to respond.

AGENDA ITEM 6

Encumbered funds

The Executive Secretary provided information on the amount of funds in the Working Capital Fund restricted for specific purposes (encumbered funds) at the beginning of *FY* 2012, and the estimated amount of the encumbered funds for the fiscal year end.

AGENDA ITEM 7

Financing of high priority projects

At PICES-2007, the Committee discussed the use of the encumbered funds designated for high-priority PICES projects and suggested that \$40,000 be earmarked for the development of the new PICES integrative scientific program, *FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems)*, and the remainder (\$103,092) be assigned for the preparation of the next North Pacific Ecosystem Status Report (Decision 07/A/3(v)). In 2008, additional funds for both these activities became available. A transfer of \$21,996 from the High Priority Projects Fund to the *FUTURE* fund was made in 2010 (Decision 2010/A/3(v)). In 2011, funds available from all completed projects in the Working Capital Fund, totalling \$76,687, were allocated for *FUTURE* (Decision 2011/A/3(iv)). The North Pacific Ecosystem Status Report appears to have sufficient financial support in the near-term. There was some discussion about the financial needs of *FUTURE*, given the newly developed roadmap produced by Science Board. Considering

the number of activities identified by FUTURE, the Committee recommended that the available balance of funds in the Working Capital Fund as of December 31, 2012, from the 2011 Zooplankton Production Symposium and 2012 PICES/ICES Conference for Early Career Scientists be allocated to FUTURE. The Committee also recommended Council to instruct the Executive Secretary to send a letter to the Contracting Parties providing information on planned activities for FUTURE and requesting contributions to these activities, particularly the Open Science Meeting in 2014 (OSM-2014).

Capacity-building activities that might require funding support for 2013 were mentioned. In addition, the Committee reviewed the current status of the Intern Program. Contracting Parties were invited to provide voluntary contributions to support the Program in 2013. Canada, Korea, and the United States indicated their intention to attempt to obtain funding in the coming year, pending availability of funds. The Committee recommended that Council instruct the Executive Secretary to invite voluntary contributions from Contracting Parties in support of the Intern Program for 2013 and beyond.

AGENDA ITEM 8

Schedule, structure and financing of future Annual Meetings

PICES-2013 will be held from October 11–20, 2013, in Nanaimo, British Columbia, Canada. The Canadian delegation confirmed that planning is on track for hosting this meeting.

The Executive Secretary reported, and the Chinese representative confirmed, the latest information from China, indicating that there are difficulties with hosting PICES-2014. Although it was indicated that more information on this situation will be provided at the Council meeting, the Committee discussed a possible approach for Council to consider in the event that China is unable to host the meeting. First, it was suggested that Council request an answer from China no later than the end of November 2012, with respect to its ability to host PICES-2014 so that various options can be explored. These options include: 1) asking Korea if it might be prepared to host PICES-2014 and give China the opportunity to host PICES-2015, 2) holding PICES-2014 at the seat of the Secretariat, and 3) merging OSM-2014 and PICES-2014.

If China is prepared to host PICES-2014, the Committee recommended that, in keeping with the 6-year rotation cycle (Decision 1994/A/6), Council invite Korea to explore the possibility of hosting PICES-2015, and inform the Secretariat on this matter by March 31, 2013.

At PICES-2001 (Victoria, Canada), Council approved the charging of a registration fee for future Annual Meetings of the Organization and indicated that the registration fee structure should be reviewed annually (Decision 2001/A/4(iv)). The Committee discussed the current registration fee structure that was changed in 2010 to include an increase in the regular and early registration categories, and recommended there be no change in the registration fees for 2013.

Type of registration fee	CDN \$
Regular	275
Early	200
Student	50
Spousal	50

At PICES-2009, Council adopted (Decision 2009/A/6(i)) the final report of the Study Group on *Restructuring of the PICES Annual Meeting* (SG-RAM). PICES-2012 was the first meeting conducted in accordance with the entire suite of SG-RAM recommendations. The Committee recommended that Council discuss the effectiveness of the approved changes at this Annual Meeting. The F&A Committee meeting was scheduled too early for a useful discussion of these changes.

F&A-2012

At PICES-2005, Council re-iterated its support for the concept of inter-sessional Science Board meetings with the participation of Council members, but suggested that the need for such a meeting should be evaluated each year and that, given meeting costs (including time commitment of the members), an inter-sessional meeting should be held only if the agenda is substantive. The Committee confirmed these views in 2012.

Science Board has already indicated the importance of having an inter-sessional meeting in 2013, to be held in conjunction with a joint PICES/ICES FUTURE-related workshop in western Russia. The Committee supported this request and recommended it to Council for approval.

AGENDA ITEM 9

Preparations for the Twenty-Fifth Anniversary of PICES

The Committee briefly reviewed the potential projects suggested by the PICES Secretariat in celebration of the Twenty-Fifth Anniversary in 2016. In addition, another project was mentioned that would be a special scientific volume in *Progress in Oceanography* that could consist of a review of the scientific advancements of PICES since its inception. The Committee recommended that Council approve the formation of a planning committee, consisting of the F&A Chairman, Science Board Chairman and Vice-Chairman, Executive Secretary, and a representative from each of the Contracting Parties. The group's responsibility would be to direct the planning of activities, fund-raising, and budget for this celebration. The F&A Chairman agreed to draft the terms of reference for the group.

AGENDA ITEM 10

PICES Visiting Scientist Program

The Committee reviewed the revised description of the Visiting Scientist Program and recommended that Council approve the description and instruct the Executive Secretary to send a letter to the Contracting Parties, requesting their proposals for contributions to the Program. It is expected that Science Board will suggest potential tasks for a visiting scientist.

AGENDA ITEM 11

PICES Publication Program

The Committee discussed the progress in implementing the Action Plan and considered whether any further transition to electronic publishing was warranted with respect to the PICES Annual Meeting Abstract Book or Scientific Report Series. The Committee recommended continuing the printing of both of these publications.

AGENDA ITEM 12

Financial issues related to the Pension Plan for PICES employees

At PICES-2010, the Committee received a report from the Executive Secretary about the deficiency in the pension funds for PICES employees and the recommendations of the International Fisheries Commissions (IFC) Pension Society for addressing these, and agreed that additional employer contributions to the IFC Pension Plan in 2010 and beyond be made in advance in order to reduce future payments. A lump sum employer contribution of \$20,000 to the IFC Pension was recommended from the *FY* 2013 budget. The Committee also recommended making an additional lump sum payment into the Pension Plan for *FY* 2012, if there is a surplus in the General Fund at the end of the year.

AGENDA ITEM 13

BudgetEstimated accounts for FY 2012 (Agenda Item 13a)

The Committee reviewed the estimated accounts for FY 2012 and recommended their acceptance by Council, noting that the expenses for “foreign exchange loss/gain” are only estimates at this time.

Interest and other income (Agenda Item 13b)

In FY 2011, the total income was \$789,308. This amount includes \$595,480 in voluntary contributions and grants (\$548,436 credited to the Working Capital Fund, \$40,108 credited to the Trust Fund, and \$6,936 credited to the Megrey Student Fund). In FY 2012, the estimated total income is \$857,599. This amount includes \$674,743 in voluntary contributions and grants (\$645,743 credited to the Working Capital Fund, \$25,000 credited to the Trust Fund, and \$4,000 credited to the Megrey Student Fund).

Relocation and Home Leave Fund (Agenda Item 13c)

At PICES-2007, Council approved the recommendation that the level of the Relocation and Home Leave Fund be allowed to fluctuate between \$90,000 and \$110,000, to minimize the need for small transfers between funds (Decision 2007/A/3(iii)). Given the estimated fund balance of \$92,959 on December 31, 2012, a transfer is not necessary this year. However, because this was a year in which home leave expenses were incurred, the Committee recommended a transfer of \$7,041 from the Working Capital Fund to bring the fund balance to a level of \$100,000.

Trust Fund (Agenda Item 13d)

In FY 2012, the total Trust Fund income is estimated at \$25,000 and estimated expenses are \$61,459. The Committee recommended that Council approve a transfer from the Working Capital Fund to recover the 2012 expenses and restore the Trust Fund to the level of \$110,000. This transfer will include \$11,870 from the amount remaining in the PICES-2010 Annual Meeting fund.

Japanese Trust Fund (Agenda Item 13e)

The Committee reviewed the information on the 2007–2012 PICES/MAFF project and the new 2012–2017 PICES/MAFF project. The status of the MAFF account, for the period from April 1 to December 31, 2011, was assessed during the regular PICES audit for FY 2011. The financial statements for the rest of *Year 5* of the first project and for *Year 1* of the new project will be evaluated during the regular PICES audit for FY 2012.

Working Capital Fund (Agenda Item 13f)

After all approved inter-fund transfers, the amount of funds available in the Working Capital Fund (WCF) on January 1, 2012, was \$733,447. This includes \$445,702 in encumbered funds and \$287,745 in “reserve operating” funds. In FY 2012, the total WCF income and expenses are estimated at a level of \$826,874 (\$645,743 are in extra-budgetary contributions and grants) and \$525,435, respectively. After the recommended inter-fund transfers, the amount of funds available in WCF at the fiscal year end is estimated at \$878,186. This includes \$584,132 in encumbered funds, and \$294,054 in “reserve operating” funds.

Budget for FY 2013 and forecast budget for FY 2014 (Agenda Item 13g)

The Committee reviewed the proposed FY 2013 budget of \$850,000 (*F&A Endnote 6*) and recommended its approval by Council. The Committee also recommended a transfer of \$113,200 from the Working Capital Fund to balance the budget, setting the total annual contribution at \$736,800, and the 2013 fees at \$122,800 per Contracting Party. These are a 2.4% increase from the FY 2012 level and the increase is based on the monthly average CPI from July 2011 to June 2012 reported by Statistics of Canada.

F&A-2012

The Executive Secretary presented the forecast *FY* 2014 budget of \$865,000 and noted that this budget is prepared based on preliminary information available as of August 15, 2012, and is approximately 1.76% higher than the *FY* 2013 budget.

AGENDA ITEM 14

Changes in PICES Chairman's Handbook: PICES Strategic Plan

The Committee reviewed the new section that was drafted regarding requirements with respect to the PICES Strategic Plan, given the Plan mandates the preparation of 3-year Action Plans for Executive Committees, Science and Technical Committees, and the Secretariat. The Committee felt the text is most appropriate for the Chairman's Handbook and not to the Rules of Procedure, and recommended that Council approve that addition to the Handbook.

AGENDA ITEM 15

F&A Action Plan

The Committee reviewed the draft F&A Action Plan developed by the Chairman and made no modifications or additions to the Plan, which will be reviewed and updated annually.

AGENDA ITEM 16

Administrative matters

The Committee discussed the progress reported on the status of negotiations regarding the possibility of obtaining an *ex gratia grant* from the British Columbia government to PICES equal to the amount of the provincial personal income taxes remitted, and encouraged the Executive Secretary to continue his efforts to request this tax rebate. The Executive Secretary may need assistance from Canadian members of Council and F&A Committee to facilitate the process for the coming year.

PICES has a Headquarters Agreement with the Government of Canada that entered into force on December 15, 1993. In accordance with this agreement, Fisheries and Oceans Canada (DFO) hosts the PICES Secretariat at the Institute of Ocean Sciences (IOS) in Sidney, British Columbia, Canada. The Executive Secretary provided a report on current arrangements between PICES and DFO/IOS and local companies on general administrative services. There appears to be no change in the arrangements at this time.

The Committee reviewed the F&A Briefing Book material regarding understaffing issues at the Secretariat and options for the timeline for transition of hiring a new Executive and Deputy Executive Secretary, given their current terms are scheduled to end in the same year of 2014. The Committee recommended that a more substantive discussion on these issues occur at the Council meeting.

AGENDA ITEM 17

Appointment of F&A Committee Chairman

Ms Patricia Livingston, the current F&A Chairman, noted that her term ends at the conclusions of PICES-2012 and cannot be extended under the PICES Rules of Procedure. The Committee recommended that Council appoint Dr. John Stein (U.S.A.) as the next F&A Committee Chairman.

AGENDA ITEM 18

Other business

There were no items discussed.

AGENDA ITEM 19

Adoption of the F&A report and recommendations to Governing Council

The draft report was circulated and approved by all F&A members. All recommendations to Council were brought forward by Ms. Livingston at the first session of Council on October 20, 2012.

F&A-2012

F&A Endnote 1

F&A participation list

Canada

Laura Richards (F&A member)
Darlene Smith (advisor)

Chul Park (F&A member)
Naesun Park (advisor)
Ungyul Yi (advisor)

Japan

Yukimasa Ishida (advisor)
Hiroyuki Shimada (F&A member)
Akihiko Yatsu (advisor)

Russian Federation

Igor Shevchenko (F&A member)

People's Republic of China

Ningsheng Yang (alternate F&A member)

U.S.A.

Elizabeth Phelps (alternate F&A member)
John Stein (F&A member)

Republic of Korea

Yong-Seok Kang (F&A member)

Other

Patricia Livingston (F&A Chairman)
Alexander Bychkov (Executive Secretary)

F&A Endnote 2

F&A Committee meeting agenda

1. Welcome and opening remarks
2. Adoption of agenda and meeting procedures
3. Audited accounts for *FY* 2011
4. Annual contributions
5. Fund-raising activities
6. Encumbered funds for PICES activities
7. Financing of PICES high priority activities
8. Schedule, structure and financing of future Annual Meetings
9. Preparations for the Twenty Fifth Anniversary of PICES
10. PICES Visiting Scientist Program
11. PICES Publication Program
12. Financial issues related to the Pension Plan for PICES employees
13. Budget
 - a. Estimated accounts for *FY* 2012
 - b. Interest and other income
 - c. Relocation and Home Leave Fund
 - d. Trust Fund
 - e. Japanese Trust Fund
 - f. Working Capital Fund
 - g. Proposed budget for *FY* 2013 and forecast budget estimates for *FY* 2014
14. PICES Rules of Procedure
15. F&A Action Plan
16. Administrative matters
17. Appointment of F&A Committee Chairman
18. Other business
19. 2012 F&A report and recommendations to Governing Council

F&A Endnote 3

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
FINANCIAL STATEMENTS
DECEMBER 31, 2011**

AUDITORS' REPORT

To the Council of the
North Pacific Marine Science Organization

We have audited the accompanying financial statements of the North Pacific Marine Science Organization, which comprise the statement of financial position as at December 31, 2011 and the statement of operations and changes in fund balances for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with the North Pacific Marine Science Organization's Financial Regulations and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Canadian auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained in our audit is sufficient and appropriate to provide a basis for our audit opinion.

Basis of Accounting

Without modifying our opinion, we draw attention to Note 2 in the financial statements, which describes the basis of accounting. The financial statements are prepared to comply with the North Pacific Marine Science Organization's Financial Regulations as referred to above.

Opinion

In our opinion, these financial statements present fairly, in all material respects, the financial position of the North Pacific Marine Science Organization as at December 31, 2011, and the results of its operations and changes in fund balances for the year then ended.

Sidney, B.C.
May 3, 2012


Chartered Accountants

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
STATEMENT OF FINANCIAL POSITION
AS AT DECEMBER 31, 2011

F&A-2012

ASSETS

	2011	2010
CURRENT ASSETS		
Cash and short term deposits (note 5)	\$ 1,346,353	\$ 1,319,408
Accounts receivable	240,352	237,835
Prepaid expenses	7,919	1,337
	\$ 1,594,624	\$ 1,558,580

LIABILITIES

CURRENT LIABILITIES

Accounts payable	\$ 196,898	\$ 126,046
Megrey Student Fund (note 3)	3,533	5,771
Funds held for Contracting Parties (note 4)	239,800	232,400
	440,231	364,217

FUND BALANCES

WORKING CAPITAL FUND (note 5)	852,047	876,450
TRUST FUND	110,000	110,000
RELOCATION AND HOME LEAVE FUND	101,443	100,000
MINISTRY OF AGRICULTURE, FORESTRY AND FISHERIES FUND	90,903	107,913
	1,154,393	1,194,363
	\$ 1,594,624	\$ 1,558,580

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
STATEMENT OF OPERATIONS AND CHANGES IN FUND BALANCES
FOR THE YEAR ENDED DECEMBER 31, 2011**

	General Fund	Working Capital Fund	Trust Fund	Relocation and Home Leave Fund	Ministry of Agriculture, Forestry and Fisheries Fund	2011 Total	2010 Total
FUND BALANCES, beginning of year	\$ -	\$ 876,450	\$ 110,000	\$ 100,000	\$ 107,913	\$ 1,194,363	\$ 972,490
SOURCES OF FUNDS							
Contributions from Contracting Parties	697,200	-	-	-	-	697,200	687,000
Budgeted transfer to General Fund (note 6)	116,800	(116,800)	-	-	-	-	-
Voluntary contributions and grants (note 7)	-	548,436	40,108	-	164,641	753,185	1,039,295
Interest and other income (note 8)	-	192,364	21	1,443	439	194,267	200,565
	814,000	624,000	40,129	1,443	165,080	1,644,652	1,926,860
FUND BALANCES, before expenditures	814,000	1,500,450	150,129	101,443	272,993	2,839,015	2,899,350
EXPENDITURES							
Personnel services	535,183	17,785	-	-	-	552,968	535,478
Annual Meeting	40,326	16,327	-	-	-	56,653	21,256
Special meetings/travel	133,105	-	30,971	-	-	164,076	167,174
Publications	31,281	-	-	-	-	31,281	48,465
Communication	40,806	-	-	-	-	40,806	33,581
Office and administration	23,350	10	-	-	-	23,360	26,359
Donation to JSFO	-	55,080	-	-	-	55,080	-
Projects (note 9)	-	542,329	-	-	-	542,329	666,819
Intern program	-	-	33,232	-	-	33,232	28,238
Relocation	-	-	-	-	-	-	9,097
MAFF Fund expenditures (note 10)	-	-	-	-	182,090	182,090	156,089
Foreign exchange loss (note 11)	2,747	-	-	-	-	2,747	12,431
	806,798	631,531	64,203	-	182,090	1,684,622	1,704,987
NET FUNDS AVAILABLE	7,202	868,919	85,926	101,443	90,903	1,154,393	1,194,363
TRANSFER TO							
WORKING CAPITAL FUND (note 5)	(7,202)	7,202	-	-	-	-	-
INTERFUND TRANSFERS (note 6)	-	(24,074)	24,074	-	-	-	-
FUND BALANCES, end of year	\$ -	\$ 852,047	\$ 110,000	\$ 101,443	\$ 90,903	\$ 1,154,393	\$ 1,194,363

NORTH PACIFIC MARINE SCIENCE ORGANIZATION **F&A-2012**
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2011

1. PURPOSE OF ORGANIZATION

The North Pacific Marine Science Organization (PICES) is an intergovernmental non-profit scientific Organization whose present members include Canada, Japan, the People's Republic of China, the Republic of Korea, the Russian Federation and the United States of America. The purpose of the Organization is to promote and coordinate marine scientific research in order to advance scientific knowledge of the North Pacific and adjacent seas.

2. ACCOUNTING POLICIES

The financial statements are prepared in accordance with the North Pacific Marine Science Organization's Financial Regulations. The following is a summary of the significant accounting policies used in the preparation of these financial statements:

(a) Fund Accounting

The Working Capital Fund represents the accumulated excess of contributions provided from Contracting Parties over expenditures in the General Fund. The purposes of the General Fund and Working Capital Fund are established by Regulation 6 of the Organization Financial Regulation.

The Trust Fund was established in 1994 for the purpose of facilitating participation of a broad spectrum of scientists in activities of the Organization.

The Relocation and Home Leave Fund was established in 1995 to pay relocation and home leave expenses of new employees and their dependents to the seat of the Secretariat and removal after period of employment has ended, and to provide home leave for international staff. The fund balance must be maintained between \$90,000 and \$110,000.

The Ministry of Agriculture, Forestry and Fisheries Fund was established in 2007. The Ministry of Agriculture, Forestry and Fisheries of Japan, through the Fisheries Agency has provided voluntary contributions for a project dedicated to the development of the prevention systems for harmful organisms in the Pacific Rim.

(b) Capital Assets

Capital assets acquired by the Organization are expensed in the year of acquisition. During the current year the Organization purchased \$14,499 of capital assets.

(c) Contributions

Contributions from Contracting Parties are recorded in the year in which they relate to. All other contributions and grants are recorded in the year received. Refer to Note 4 for contributions restricted for specific designated projects.

(d) Income Tax

The Organization is a non-taxable Organization under the Privileges and Immunities (International Organizations) Act (Canada).

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2011

(e) Foreign Exchange

Transactions originating in foreign currencies are translated at the exchange rate prevailing at the transaction dates. Assets and liabilities denominated in foreign currency are translated to equivalent Canadian amounts at the current rate of exchange at the statement of financial position date.

(f) Financial Instruments

In September 2008, the Canadian Institute of Chartered Accountants announced that the adoption of the new accounting recommendations regarding the recognition, measurement and presentation of financial instruments, following the release of Sections 1530, "Comprehensive income," 3855, "Financial instruments — recognition and measurement", 3862, "Financial Instruments — disclosure," 3863, "Financial Instruments — presentation" and 3865, "Hedges" was not required for non-profit enterprises. The Organization chose not to adopt these sections and to continue to present and disclose financial instruments in accordance with Section 3861, "Financial Instruments – Disclosure and Presentation".

The Organization's financial instruments consist of cash and short-term deposits, accounts receivable and accounts payable, the fair value of which approximates their carrying value. Unless otherwise noted it is management's opinion that the company is not exposed to significant interest, currency or credit risks.

(g) Use of Estimates

The preparation of financial statements in conformity with Canadian standards for not-for-profit organizations requires management to make estimates and assumptions that effect the reported amounts of assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

3. MEGREY STUDENT FUND

The Megrey Student Fund represents trust funds held to cover student travel. Changes in the fund during the year are as follows:

	2011	2010
Beginning balance	\$ 5,771	\$ -
Add: Contributions received	6,936	5,771
Less: Student travel grants paid	(9,174)	-
	\$ 3,533	\$ 5,771

NORTH PACIFIC MARINE SCIENCE ORGANIZATION **F&A-2012**
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2011

4. FUNDS HELD FOR CONTRACTING PARTIES

The funds held for Contracting Parties are advance contributions from Japan in the amount of \$119,900 and the U.S.A. in the amount of \$119,900.

5. WORKING CAPITAL FUND

Of the total amount in the Working Capital Fund, \$445,702 of cash and short term deposits is restricted for specific designated projects.

Pursuant to decision 2011/A/3(ii) of the Governing Council, \$118,600 of the funds held in the Working Capital Fund will be transferred to the General Fund at the beginning of the 2012 fiscal year to balance the budget, setting the total annual contribution at \$719,400, and the 2012 annual fee at \$119,900 per Contracting Party.

Pursuant to Financial Regulation 6 (iii), the Working Capital Fund is to be increased/decreased by the surplus/deficit in the General Fund.

6. INTERFUND TRANSFERS

The Governing Council approved the transfer of \$116,800 at the beginning of 2011 from the Working Capital Fund to the General Fund (Decision 2010/A/3/ii) to balance the budget, setting the total annual contribution at \$697,200, and the 2011 annual fee at \$116,200 per Contracting Party.

The Governing Council approved the transfer of funds from the Working Capital Fund to restore the Trust Fund to \$110,000 by the end of 2011 (Decision 2011/A/3/iii). The amount of the transfer was \$24,074.

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2011

7. VOLUNTARY CONTRIBUTIONS AND GRANTS

	Working Capital	
	Fund	Trust Fund
Contributions to the Cohen Commission (Canada report)	\$ 8,302	\$ -
Contributions for the North Pacific CPR Project		
DFO (Canada)	50,000	-
NPRB (U.S.A.)	54,838	-
EVOS (U.S.A.)	57,714	-
Contributions for the 2011 Zooplankton Production Symposium:		
EUR - OCEANS	6,802	-
IRD (U.S.A.)	3,792	-
IOC	3,922	-
Registration fees	50,944	-
Contributions for the 2011 ESSAS Open Science Meeting:		
GOOS	9,495	-
NMFS (U.S.A.)	9,551	-
UW/NSF (U.S.A.)	24,570	-
Registration fees	60,471	-
Contributions to the 2012 Climate Change Symposium (Yeosu, Korea):		
Expo-2012 Organizing Committee	44,414	-
NMFS (U.S.A.)	47,755	-
NPRB (U.S.A.)	14,329	-
DFO (Canada)	15,000	-
IPHC	6,155	-
NPAFC	5,000	-
FAO	3,071	-
Registration fees	2,779	-
Contributions for PICES 2011:		
SCOR Travel grant	-	5,067
Contributions for PICES 2013:		
DFO (Canada)	50,000	-
Contributions to part time Secretariat position:		
KORDI (Korea)	19,532	-
Contributions to Intern program:		
DFO (Canada)	-	10,000
MLTM (Korea)	-	9,766
NMFS (U.S.A.)	-	15,275
	\$ 548,436	\$ 40,108

NORTH PACIFIC MARINE SCIENCE ORGANIZATION **F&A-2012**
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2011

8. INTEREST AND OTHER INCOME

	Working Capital Fund	Trust Fund	Relocation and Home Leave Fund	Ministry of Agriculture, Forestry and Fisheries Fund
Interest income	\$ 7,135	\$ 21	\$ 1,443	\$ 439
Income tax levies	71,568	-	-	-
HST rebates	14,988	-	-	-
Overhead from Cohen Commission	908	-	-	-
Overhead from 2011 ESSAS OSM	9,058	-	-	-
Overhead from MAFF project	21,403	-	-	-
PICES 2011 registration fees	67,284	-	-	-
Miscellaneous income	20	-	-	-
	\$ 192,364	\$ 21	\$ 1,443	\$ 439

9. PROJECTS

The expenditures in the Working Capital Fund for projects funded by voluntary contributions designated for the respective projects are as follows:.

	2011	2010
2012 Climate Change Symposium	\$ 10,168	\$ -
2010 Climate Change Symposium	1,983	219,968
Cohen Commission Report	1,319	20,388
Development of FUTURE	28,832	27,991
2012 Early Career Scientists Conference	93,396	-
2011 ESSAS Open Science Meeting	110,545	17,099
2011 Inter-sessional Science Board Meeting	5,289	-
North Pacific CPR Project	146,093	159,500
North Pacific Ecosystem Status Report	4,087	113,455
PICES 2011 - Aquaculture Topic Session	3,450	-
PICES 2010	598	98,227
2011 Zooplankton Production Symposium	136,569	10,191
	\$ 542,329	\$ 666,819

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2011

10. MINISTRY OF AGRICULTURE, FORESTRY AND FISHERIES FUND EXPENDITURES

	2011	2010
Special meetings	\$ 110,637	\$ 68,195
Contractual services	38,964	26,649
Equipment	11,013	36,526
Overhead to PICES	21,403	24,376
Miscellaneous	73	343
	\$ 182,090	\$ 156,089

11. FOREIGN EXCHANGE GAIN / LOSS

At year end all funds held in foreign currency (US \$53,078) are converted to Canadian dollars using the December 31st exchange rate. A foreign exchange loss has been reported on the current year financial statements; this amount is an unbudgeted item which has been caused by the ongoing fluctuations in the US dollar (2011 = 1.017, 2010 = 0.9946), and not by the actual purchase or sale of any foreign currencies.

12. UNFUNDED PENSION LIABILITY

The Organization holds a pension plan for its employees with the International Fisheries Commissions Pension Society. The actuarial valuation report was prepared as at January 1, 2011 and showed an unfunded pension liability for PICES of \$286,000. This liability is being paid in monthly installments of \$3,100 (\$37,200 per year), beginning January 2012.

No amount has been recorded in the financial statements with regards to the total unfunded liability.

13. FINANCIAL STATEMENTS

A statement of cash flows has not been presented, as the required information is readily apparent from the other financial statements presented and the notes to the financial statements.

The financial statements have been reclassified, where applicable, to conform to the presentation used in the current year. The changes do not affect prior years earnings.

F&A Endnote 4**PAYMENT SCHEDULE OF ANNUAL FEES, 2005–2012¹**

	<i>Canada</i>	<i>China</i>	<i>Japan</i>	<i>Korea</i>	<i>Russia</i>	<i>USA</i>
2005	Dec. 24, 04	Sept. 22, 05²	Mar. 2, 05	Mar. 30, 05	Mar. 31, 05³	Jan. 10, 05
2006	Dec. 28, 05	Aug. 1, 06	Dec. 15, 05	Feb. 8, 06	Feb. 28, 06	Jan. 30, 06
2007	Jan. 23, 07	July 3, 07	Dec. 5, 06	Apr. 3, 07	Feb. 13, 07	Jan. 10, 07
2008	Jan. 16, 08	May 15, 08	Dec. 20, 07	Feb. 15, 08	Feb. 13, 08	Jan. 7, 08⁴
2009	Jan. 5, 09	June 3, 09	Dec. 11, 08	Apr. 1, 09	Mar. 27, 09	Dec. 24, 08
2010	Apr. 1, 10	Aug. 5, 10	Dec. 14, 09	Mar. 2, 10	Mar. 26, 10	Dec. 11, 09
2011	Feb. 8, 11	June 30, 11	Dec. 3, 10	Mar. 25, 11⁵	Feb. 9, 11	Dec. 7, 10
2012	Jan. 3, 12	Aug. 31, 12	Nov. 22, 2011	Oct. 11, 12	Mar. 29, 12	Nov. 16, 11

¹ Late (after March 31) or partial payments are indicated in bold

² Partial (86%) payment, remainder paid December 30, 2005

³ Partial (96.6%) payment, remainder paid April 25, 2005

⁴ Partial (92.3%) payment, remainder paid on May 22, 2009

⁵ Partial (88.1%) payment, remainder paid on September 20, 2011

F&A Endnote 5**External funding and voluntary contributions received since PICES-2011**

For the period since PICES-2011, the following external funding and voluntary contributions were committed and/or received for various activities of the Organization:

Special projects

- The Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan, through the Fisheries Agency of Japan (JFA), approved funding for a new 5-year (April 1, 2012 – March 31, 2017) PICES project on “*Marine ecosystem health and human well-being*”. The goal of this project is to identify the relationships between sustainable human communities and productive marine ecosystems in the North Pacific, under the concept of fishery social-ecological systems. FRA has transferred \$149,880 to PICES for *Year 1* (to be completed by March 31, 2013) of the project.
- The United States contributed \$150,000 US to support the significant work involved in providing North Pacific-related content to the World Ocean Assessment, the UN-established process for global reporting and assessment of the state of the marine environment, including socioeconomic aspects.
- In October 2007, PICES initiated a funding consortium to support the North Pacific Continuous Plankton Recorder (NP CPR) survey. The following 5 agencies have committed their resources for the project:
 - Fisheries and Oceans Canada, a member of the consortium since 2008, provided \$50,000 CAD for the period from April 1, 2011 to March 31, 2012. This support is intended to continue for another 2 years (until March 2014) at the level of \$50,000 CAD per year.
 - The North Pacific Research Board (USA) joined the consortium in 2009 and committed \$50,000 US per year for 5 years (until May 31, 2014) to support operations of the NP CPR project.
 - The *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) approved funding of \$188,600 US for operations of the NP CPR project in 2010–2012, and report writing in 2013 (project on “*Measuring Interannual Variability in the Herring’s Forage Base from the Gulf of Alaska*”), with the amount of \$59,700 US for 2012. A new project on “*Long-term monitoring of zooplankton populations on the Alaskan Shelf and Gulf of Alaska using Continuous Plankton Recorders*”, with a similar level of funding from 2013 to 2016 (incremented each year to reflect cost of living increases), was approved in the fall of 2011 as a part of a Long Term Monitoring Program of EVOSTC.

F&A-2012

- The Japanese Society for Promotion of Science (JSPS) provided a 5-year (2009–2013) grant for CPR work to Dr. Sanae Chiba (JAMSTEC). While funds are not passed to the PICES consortium, this project provides in-kind support by taking over the analysis of samples from the western Pacific and is equivalent to a financial contribution of about \$37,500 US per year.
- The CPR parent organization, the Sir Alister Hardy Foundation for Ocean Science (SAHFOS, UK), contributes the remaining funds required to operate the survey at its current level.

Symposia/sessions/workshops

- The following organizations/agencies/institutions provided financial support for the 2nd PICES/ICES/IOC Symposium on “*Effects of climate change on the world’s oceans*”, held May 13–20, 2012, in Yeosu, Korea, as one of the official academic events related to the Ocean Expo-2012 (funds marked by * were handled by PICES):
 - EAST-I Research Project, Korea – \$19,275 (2012)*
 - Expo-2012 Organizing Committee – 100,000,000 KRW (\$44,539 in 2010 and \$44,414 in 2011)*
 - Fisheries and Oceans Canada – \$15,000 (2011)*
 - Food and Agriculture Organization – \$10,000 US (\$3,000 US in 2011 and \$7,000 US in 2012)*
 - Institute for Marine and Antarctic Studies, Australia – \$4,140 (2012)*
 - Integrated Marine Biogeochemistry and Ecosystem Research – \$3,000 US (2012)
 - International Council for the Exploration of the Sea – 10,000 €+ publication in IJMS (2012)
 - Intergovernmental Oceanographic Commission of UNESCO – \$13,000 US (2012)*
 - International Pacific Halibut Commission – \$6,000 US (2011)*
 - Korea Meteorological Administration – \$5,000 US (2012)
 - Korea Ocean Research and Development Institute – local services
 - Ministry of Land, Transport and Maritime Affairs, Korea – welcome reception
 - National Aeronautics and Space Administration, USA – \$25,000 (2012)*
 - National Fisheries Research and Development Institute, Korea – \$5,000 US
 - National Marine Fisheries Service of NOAA, USA – \$50,000 US (2011)*
 - North Pacific Anadromous Fish Commission – \$5,000 (2011)*
 - North Pacific Research Board, USA – \$15,000 US (2011)*
 - Ocean Climate Change: Analysis, Projection, Adaptation project, Korea – support for S3 Topic Session
 - Pukyong National University, Korea – \$5,000 US (2012)
 - Pusan National University, Korea – \$5,000 US (2012)
 - Scientific Committee on Oceanic Research – \$5,000 US (2012)*
 - World Climate Research Programme – \$10,000 US (2012)
- Several international and national organizations/programs were invited, and subsequently agreed, to co-sponsor (by covering travel of additional invited speakers and/or convenors for these events) the following scientific sessions and workshops to be held at the 2012 PICES Annual Meeting (October 12–21, 2012, Hiroshima, Japan): “*Challenges in understanding Northern Hemisphere ocean climate variability and change*” (CLIVAR and ICES), “*Environmental contaminants in marine ecosystems: Seabirds and marine mammals as sentinels of ecosystem health*” (JSPS), “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*” (ICES), “*Ecosystem responses to multiple stressors in the North Pacific*” (SOLAS), “*Effects of natural and artificial calamities on marine ecosystems and the scheme for their mitigation*” (JSFO and FRA), “*Changing ocean biogeochemistry and its ecosystem impacts*” (ICES, IMBER and SOLAS), and “*Global patterns of phytoplankton dynamics in coastal ecosystems*” (SCOR).
- The Local Organizing Committee of the 2012 PICES Annual Meeting provided 2,000,000 JPY to cover travel expenses for selected scientists and students to attend the meeting.
- Fisheries and Oceans Canada provided \$100,000 for the 2013 PICES Annual Meeting to be held October 11–20, 2013, in Nanaimo, British Columbia, Canada.

Capacity building

- Several contributions were received/committed for the Trust Fund in support of the PICES Intern Program:
 - Fisheries and Oceans Canada – \$10,000;
 - National Marine Fisheries Service of NOAA, USA – \$20,000 US (\$10,000 per year in 2012 and 2013);

- The North Pacific Research Board provided \$5,000 US to support the 2012 PICES/ICES Conference for Early Career Scientists on “*Oceans of Change*”, held April 24–27, 2012, in Majorca, Spain.
- The remainder (\$4,000 US) of the late Dr. Bernard Megrey’s family’s contribution, held by the Oregon State University, was transferred to PICES to support participation of graduate students and early career scientists in PICES Annual Meetings and conferences co-sponsored by the Organization.
- The Scientific Committee on Oceanic Research (SCOR) provided a grant of \$5,000 US to support participation of scientists from countries with “economies in transition” in SCOR-relevant sessions and/or workshops at the 2012 PICES Annual Meeting.

Operations of the PICES Secretariat

- The Korea Ocean Research and Development Institute contributed \$20,000 US to support a part-time contract position at the PICES Secretariat to assist the Science Board Chairman.
- A 13% overhead (\$19,484) of the *Year 1* budget for the PICES/MAFF project on “*Marine ecosystem health and human well-being*” was retained to offset expenses related to the Secretariat’s involvement in the project.

F&A Endnote 6

PROPOSED FY 2013 BUDGET

Sources for General Fund (GNF)		Amount
National contributions		736,800
Transfer from Working Capital Fund	(\$122,800 per Contracting Party)	113,200
Total		850,000

Category	GNF Allotment	WCF Allotments
Personnel Services	568,000	benefit adjustments and additional contribution to the IFC Pension Plan
Annual Meeting	20,000	registration fee revenue as needed/available
Special Meetings/Travel	160,000	encumbered funds as needed/available
Publications	40,000	
Communications	36,000	
Office/Administrative	26,000	encumbered funds as needed/available
Projects		
Total	850,000	

Guaranteed revenue	90,000
Net income tax levies	75,000
Tax (GST, PST) rebate	8,000
Interest	7,000
Additional income	84,000
Registration fees for PICES-2013	65,000
Overhead from the PICES/MAFF project	19,000

Report of the 2012 Inter-sessional Science Board Meeting

Science Board met in Busan, Korea from 14:00–18:00 on May 24 and all day on May 25, 2012. Science Board Chairman, Dr. Sinjae Yoo, welcomed members and guests, and introductions were made (*ISB Endnote 1*). The draft agenda (*ISB Endnote 2*) was reviewed and a proposal for a PICES summer school in China was added to Agenda Item 13 on “Capacity building”. Agenda Item 7 on “Expert groups with issues” was discussed first to accommodate the schedules of invited guests. It was decided that Agenda Item 9 on “Committee Action Plans” would be discussed as the last item of business.



Science Board members, front row l to r: Alexander Bychkov (PICES Secretariat), Hiroaki Saito, Toru Suzuki, Mitsutaku Makino (invited), R. Ian Perry (invited); (back row l to r) Fangli Qiao, Kyung-Il Chang, Hiroyuki Shimada (F&A), Igor Shevchenko, Thomas Therriault, Sinjae Yoo, Atsushi Tsuda, Libby Logerwell, Lev Borcharov (PICES Chairman), Hiroyuki Sugisaki, Patricia Livingston (F&A), Skip McKinnell (PICES Secretariat).

Thursday, May 24, 2012

AGENDA ITEM 2

Expert groups with issues

Section on Harmful Algal Blooms (S-HAB)

Co-Chair of the Section on *Harmful Algal Blooms* (S-HAB), Dr. Vera Trainer, briefly reviewed the Section’s major accomplishments. These included joining the PICES HAB database with that of ICES to produce PICES/ICES HAE-DAT, and capacity building in the form of training sessions to detect and monitor HABs in countries undergoing economic transition in the Pacific. Terms of reference (TOR) were revised to align with FUTURE. Science Board members made suggestions for further revision and recommended the revised TORs be circulated to S-HAB members for comment before being re-submitted to Science Board for review at least one month prior to PICES-2012.

Current problems in S-HAB that require action included: finding Chinese experts who can contribute to HAE-DAT, and an imbalanced sharing of the co-chairmen’s workload in the section. Dr. Trainer requested assistance from Science Board. The present definition of HABs will be changing in the future to include nutritionally inadequate species. To be proactive in this change and to better contribute to the objectives of FUTURE, Dr. Trainer announced that S-HAB will discuss changing its name at PICES-2012. The change would also entail recruiting new members, including potential Chinese members, Drs. Chunjiang Guan and Douding Lu (requested at PICES-2011) and jellyfish expert, Dr. Song Sun.

ISB-2012

S-HAB member, Dr. Mark Wells, described plans for a major international workshop on “*Harmful algal blooms in a changing world*” as was recommended by the IOC Panel on Harmful Algal Blooms (IPHAB) resolution IPHAB-X.6, but due to funding limitations, he proposed holding a smaller workshop in 2013 composed of not more than 10 HAB experts to identify unresolved issues that limit the advances in understanding how projected climate change may influence HAB events. Dr. Wells asked Science Board to recommend supporting three participants from PICES to attend the workshop. In the meantime, he was waiting for a reply on funding from the National Science Foundation to understand what level of support would be available from this U.S. source for a workshop.

Action:

- Dr. Qiao to convey requests for HAEDAT experts, and potential Chinese members to appropriate channels.
- Dr. Chang to convey Dr. Trainer’s need for greater assistance from Dr. Changkyu Lee.
- Dr. Trainer to submit revised S-HAB terms of reference to Science Board by September 10, 2012.

AGENDA ITEM 3

Interactions with other organizations

SCOR

Seven proposals for new SCOR Working Group were presented to Science Board for potential co-sponsorship by PICES. Each proposal was assigned to one or more PICES Committees according to relevancy. Science Board Chairman asked Committee Chairmen to review relevant proposals with their members and to rank them as high, medium or low priority for PICES participation.

Action: Committee Chairmen to provide rankings to Dr. Yoo by July 31.

UN Regular Process (UNRP for Global Reporting and Assessment of the State of the Marine Environment)

At PICES-2011, Governing Council instructed the Executive Secretary to send a letter to the Director of the Division for Ocean Affairs of the UNRP expressing an interest by PICES scientists to conduct peer reviews of regional assessments conducted in the region of primary concern to PICES. The offer was declined subsequently.

Dr. Skip McKinnell was an observer at the *Workshop for Eastern and South-eastern Asian Seas, under the auspices of the United Nations, in support of the Regular Process for global reporting and assessment of the state of the marine environment, including socio-economic aspects*, hosted by the State Oceanic Administration and the Ministry of Foreign Affairs of the Peoples Republic of China in Sanya City from February 21–23, 2012. It was a workshop to determine what resources, including existing assessments, were available in the region to undertake the regional assessment. Under agenda item 5 on *Overview of the existing regional assessments*, Dr. Chul Park (Korea) gave a presentation on the PICES approach to status and trend reporting in the North Pacific. A majority of the participants were non-scientists. Capacity building featured prominently in the agenda. As there is little opportunity for regional international organizations to participate in the process, Science Board agreed to not pursue the matter further.

Intergovernmental Panel on Climate Change request for review

A request came to Dr. McKinnell from one of the lead authors of Chapter 30 of the IPCC’s 5th Assessment Report to review draft text on a section of the chapter entitled “High latitude spring bloom regions.” In response, Dr. McKinnell proposed that the review might be expanded to include members of the BIO Committee. The proposal was accepted. BIO Chairman, Dr. Atsushi Tsuda, and Vice-Chairman, Dr. Michael Dagg assembled comments from BIO members and Dr. McKinnell and prepared a response. Science Board agreed unanimously that it was a great opportunity for the Organization to become involved and to offer PICES services as reviewers for IPCC.

Action: Secretariat to explore options for PICES to be involved in the review process for the IPCC AR5.

AGENDA ITEM 4

Status of proposed publications

Science Board reviewed a list of recent and anticipated publications. It was noted that selected papers from the 26th Lowell Wakefield Symposium on “*Ecosystems 2010: Global progress on ecosystem-based fisheries management*” with guest editors, G. Kruse, P. Livingston, C.-I. Zhang and G. Jamieson should be added to the list. The issue of the still-unpublished CFAME Task Team report for the PICES Scientific Report series was discussed. It was noted that despite considerable time elapsing since CFAME was disbanded, its report was still of value and its completion should be encouraged. Science Board also felt it would be worthwhile to have access to the final presentation of Study Group on *PICES Communication* outlining its recommendations.

Action:

- Dr. Batchelder to contact Dr. Kerim Aydin to discuss status of the CFAME report
- Secretariat to put a link to the SG-COM report presentation

AGENDA ITEM 5

Status of proposed inter-sessional workshops/symposia

(a) Inter-sessional workshops/symposia

Science Board reviewed the list of PICES-sponsored meeting, symposium and workshops that will take place in 2012. As Dr. Yoo was not able to attend, he called for a volunteer, preferably from Korea or Japan, to attend an IMBER/APN/PICES sponsored workshop on “*Needs assessment for capacity development for integrated marine biogeochemistry and ecosystem research in the Asia-Pacific region*”. Dr. Mitsutaku Makino offered to represent PICES at the meeting, pending approval from his institution.

Action: Dr. Yoo to write a letter to the director of the National Research Institute of Fisheries Science, requesting Dr. Makino’s presence at the workshop.

(b) Co-sponsoring sessions and deadlines for joint PICES/ICES meetings

Science Board discussed whether PICES needed to engage ICES sooner than the second week of September to exchange lists of proposed topic sessions and workshops at each other’s annual meetings. There was difficulty getting responses from some Committee/FUTURE-AP members about sessions to co-sponsor and/or suggestions for PICES convenors. It was decided that sufficient time was given to Committee/FUTURE Chairs to get input from their members, and that it was up to the Chairs to ensure the deadline was not missed.

(c) New proposals to co-sponsor inter-sessional workshops/symposia

Science Board agreed that PICES should co-sponsor the 8th International Conference on Marine Bioinvasions to be held August 2013 in Vancouver, Canada, and IMBER’s IMBIZO III to be held January 28-31, 2013 in Goa, India. PICES has co-sponsored these activities previously and recommended support at levels as in past meetings. Science Board will recommend that PICES be a co-sponsor of the next International Symposium on the “*Effects of climate change on the world’s oceans*” to take place in Brazil in 2016.

The 7th International Fisheries Observer and Monitoring Conference (April 8-12, 2013, Viña del Mar, Chile) and the 28th Wakefield Fisheries Symposium (March 26-29, 2013, Anchorage, USA) were brought to the attention of Science Board. FIS did not support PICES sponsorship of the former because PICES should concentrate on supporting symposia that advance marine science. The 2013 Wakefield Symposium has a focus on the Arctic. As neither of these events was centred on priority areas for PICES, Science Board was not prepared to recommend PICES as a co-sponsor.

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Introduced under Agenda Item 4, Science Board was not prepared to recommend supporting a workshop on “*HABs in a changing world*”, to be organized by Drs. Mark Wells (PICES) and Bengt Karlson (ICES), until more details about the contributions of other potential co-sponsors became available.

Dr. Batchelder introduced the “Belmont Forum and G8 Research Councils Initiative on Multilateral Research Funding International Opportunities” as an excellent opportunity for PICES to be involved in research in areas of coastal vulnerability.

Action: Drs. Perry and Makino to contact potential academics in PICES countries currently involved in the Initiative to prepare pre-proposals for submission to NSF by closing date of July 20, 2012.

(d) *Upcoming ICES symposia for potential PICES co-sponsorship*

Dr. Yoo asked Committee/FUTURE Chairs to discuss with their members upcoming ICES symposia listed on the ICES website that might be relevant to PICES.

Action: Committee/FUTURE Chairs to bring any recommendations on PICES co-sponsorship of ICES symposia for discussion at PICES-2012.

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AGENDA ITEM 6 (CONTINUED)

Expert groups with issues

Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24)

Science Board agreed that the final report of WG 24 would not be complete without China’s contribution. Dr. Fangli Qiao, representing China, informed Science Board that, so far, the response from China was not good, but that he would try again to contact the three WG members from CAFS/MOA and one member from SOA to encourage China’s report. WG 24’s proposal to establish a new study group on aquaculture was not supported by the FIS Committee who felt that, with an incomplete final report, the topic could be dealt with through a topic session or workshop at a PICES Annual Meeting.

Recommendation:

- Science Board does not recommend the establishment of a new study group on aquaculture;
- allow Dr. Qiao time to work with the Chinese members of WG 24, and if unsuccessful, publish an incomplete final report electronically.

AGENDA ITEM 7

Report on newly formed expert groups

Due to the recent termination of the marine pollution research function in Fisheries and Oceans Canada, an inter-sessional report by Dr. Ross, Chairman of the Study Group on *Marine Pollutants*, was not available for Science Board to review. Considering the sensitive nature of the circumstances, Science Board decided to wait for a reasonable amount of time to pass before inquiring about the report.

Action: Secretariat to forward a request to Dr. Ross through his Division Head, Mr. Robin Brown.

As the Committee/FUTURE Chairs were also present at the preceding FUTURE roadmap workshop (May 22–24) in which presentations or discussions were conducted by the Co-Chair of the Section on *Human Dimensions of Marine Systems*, Dr. Mitsutaku Makino, and Co-Chair of the Section on *Climate Change Effects on Marine Ecosystems*, Dr. Anne Hollowed, no further discussion on these reports took place at the meeting.

AGENDA ITEM 8

New PICES project

Dr. Ian Perry, one of the Principal Investigators of the proposed PICES project on “*Marine ecosystem health and human well-being (sato-umi)*” that will be supported by incremental funding from the Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF), asked for Science Board’s approval to start the activity after presenting a set of principles which would include identifying the relationships between sustainable human communities and productive marine ecosystems in the North Pacific under the concept of fishery social-ecological systems and would link directly with the FUTURE research theme on “How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems?” The project would integrate, support and expand the activities of several PICES expert groups, including the Section on *Human Dimensions of Marine Systems*, Working Group (WG 28) on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors*, Working Group (WG 24) on *Environmental Interactions of Marine Aquaculture*, and Working Group (WG 21) on *Non-indigenous Aquatic Species*. Science Board agreed that the project would make a very important contribution to FUTURE and agreed with the overall principles. Given the relatively broad scope of project, Science Board requested that “sato-umi” (a specific form of human-marine ecosystem relationship) be removed from the title of the project. Science Board endorsed Drs. Perry and Makino as the Principal Investigators. They will develop a project team and hold their first meeting at PICES-2012. Science Board reminded Drs. Perry and Makino to have a list of members in place before PICES-2012.

Action:

- Drs. Perry and Makino to have a membership list in place before PICES-2012.

AGENDA ITEM 9

Mid-year reports from Scientific and Technical Committees

Brief highlights of Committee and expert group activities since PICES-2011, and any requests, are provided below. Discussion of Committee Action Plans was deferred to Agenda Item 20.

Biological Oceanography Committee (BIO)

BIO Chairman, Dr. Atsushi Tsuda, announced that BIO agreed to be a co-parent committee, along with POC, of the Working Group on *Regional Climate Modeling* (WG 29). BIO requested that WG 29 be augmented to add one or two biologists, and some activity that is focused on issues of importance to the BIO Committee.

BIO’s review of a section on “High-latitude spring bloom regions” for Chapter 30 of the IPCC WG2 AR5 report was favourably received by one of the IPCC chapter lead authors.

BIO is sponsoring/co-sponsoring 4 topic sessions, a contributed paper session and 4 workshops at PICES-2012. All convenors were in place.

A draft of the final report of the Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22) was sent by WG 22 Co-Chairman, Dr. Fai Chai, to Dr. Tsuda just prior to the inter-sessional Science Board meeting, and has not yet been distributed to BIO members for review. BIO will finalize the report by end of June so publication in the PICES Scientific Report series can proceed. The final report of the Working Group on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim* (WG 23) will be finished by the end of the summer. An article on the formation of the Working Group on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequences* (WG 26) at PICES-2011 was published in the Winter issue of PICES Press (2012, Vol. 20, No. 1). The WG has already reviewed an outline for its final report, and Dr. Tsuda invited Science Board to provide any comments. A topic session (S7) dedicated to “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*” will be held at PICES-2012. Working Group on *Development of Ecosystem Indicators to Characterize*

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Ecosystem Responses to Multiple Stressors (WG 28) Co-Chairs, Drs. Ian Perry and Motomitsu Takahashi, are actively preparing a framework and template to map stressors and sensitive habitats for common use in comparing PICES regions. The framework includes: 1) setting the scene, 2) identification of the component habitats, 3) identification of stressors, and 4) ranking each habitat according to its vulnerability to each stressor. A topic session (S10) and workshop (W1) related to WG 28 will be held at PICES-2012.

The Section on Carbon and Climate (S-CC) completed its second level Quality Control and opened the PACIFICA database for public use. Drs. James Christian and Kitack Lee were co-convenors of the theme session (S10) on “*Changes in the marine carbon cycle*” at the 2nd International Symposium on “*Effects of climate change on the world’s oceans*” (May 13–20, 2012, Yeosu, Korea). The Section is in the process of making contributions to the IPCC AR5. Dr. Richard Feely (USA) is a lead author for Chapter 3 (Observations: Oceans) and Dr. Christopher Sabine (USA) for Chapter 6 (Carbon and Other Biogeochemical Cycles). Several members from the Section are contributing authors/expert reviewers or are preparing manuscripts for submission prior to the July 31 deadline.

A subset of The Marine Ecosystem Model Inter-Comparison Project (MEMIP) investigators (Drs. Hal Batchelder, Yvette Spitz, Angelica Peña, and Jerome Fiechter) met from March 26–30, 2012 for a workshop in Corvallis, USA, to work out key steps needed to complete the model intercomparison and model-data comparisons of two test beds (Newport and GAK lines). The investigators hope to have runs for the two North Pacific coastal systems successfully before PICES-2012.

The Advisory Panel on Marine Birds and Mammals (AP-MBM) is making progress on a new activity in re-evaluating and updating prey consumption by marine birds and mammals and predatory fish that started after PICES-2011.

Fishery Science Committee (FIS)

FIS Chair, Dr. Libby Logerwell, reported that she received input from members from all PICES countries except China on suggestions for approaches to incorporate aquaculture science into PICES more effectively. The suggestions included the use of topic sessions, workshops and international symposia rather than establishing expert groups. It was also acknowledged that the primary interests of each member country with regard to aquaculture are different and that one reason for the lack of success in fulfilling objectives was that the WG tried to cover a broad range of topics (capacity, technology, disease, risk assessment, *etc.*). One committee member suggested that non-feeding culture of oyster, clam, scallop and seaweed is affected by oceanographic events and anthropogenic forcing such that understanding the relationship between fluctuations of aquaculture productivity and oceanographic environment would contribute to the goals of AP-AICE (of FUTURE). FIS did not show strong support for the formation of a study group until WG 24 had submitted its final report with recommendations.

FIS is co-sponsoring 5 topic sessions, and sponsoring a contributed paper session at PICES-2012. All convenors were in place.

FIS ranked SCOR Working Group proposals for PICES affiliate status and placed Working Group to identify Ecosystem Essential Ocean Variables for measuring change in the biological properties of marine ecosystems and a Working Group on Marine ecosystem reorganisation under climate change as the two highest. PICES was invited to be an observer at the 12th meeting of the International Scientific Committee for Tuna and Tuna-like Species to be held July 18–23, 2012, in Sapporo, Japan. FIS member, Dr. Toyomitsu Horii will represent PICES at the meeting.

A special issue of the journal *Fisheries Research* (112: 105–188), edited by P.A. Livingston, G.H. Kruse and L. Richards was published in December 2011 stemming from the PICES 2009 Topic Session (S2) on “*Ecosystem-based approaches for the assessment of fisheries under data limited situations*”. Proceedings of the PICES co-sponsored symposium on “*Ecosystems 2010: Global progress on ecosystem based fisheries*

management” is in the final stages of production. This symposium was convened November 8–11, 2010, in Anchorage, Alaska, USA and was also co-sponsored by ICES, FAO, and a host of regional organizations (NMFS, ADF&G, *etc.*). It is being published as a book by the University of Alaska Sea Grant.

Marine Environmental Quality Committee (MEQ)

Because of the sudden announcement (May 15) by MEQ Chairman, Dr. Steve Rumrill, that he cannot continue to be involved in PICES activities, an MEQ report was not prepared for Science Board. As the last two Chairmen were from the eastern Pacific, the Science Board Chairman suggested that MEQ consider nominating/electing a representative for China. According to the Rules of Procedure, Dr. Makino (Vice-chairman) was asked to take over the chairman’s duties until elections could be run before or at PICES-2012. Executive Secretary, Dr. Alexander Bychkov, stated that the Secretariat would try to lighten the burden on Dr. Makino. Several MEQ Committee membership problems were noted: of the two U.S. members, one newly appointed member has not previously been involved in the marine environmental quality field; Canada has only two members, and Russia one.

Action:

- Dr. Makino to serve as Chairman until an election can be held.
- Science Board to discuss potential candidates by correspondence
- Secretariat to issue a formal request to the U.S. national delegate for a U.S. member to replace Dr. Rumrill

Physical Oceanography and Climate Committee (POC)

POC Chairman, Dr. Kyung-II Chang, reported that its subsidiary bodies, Section on *Climate Change Effects on Marine Ecosystems* (S-CCME), Section of *Carbon and Climate* (S-CC), and Working Group on *Regional Climate Modeling* (WG 29) were actively represented by Enrique Curchitser and Chan Joo Jang (WG 29), Suam Kim and Anne Hollowed (S-CCME), and James Christian (S-CC) at the FUTURE roadmap workshop (May 22-24, Busan, Korea) preceding this meeting. Dr. Emanuele Di Lorenzo (WG-27) attempted to participate remotely but the connection was lost.

Dr. Curchitser was a co-convenor of the Topic Session (S3) on “*Projections of climate change impacts on marine ecosystems and their uncertainty*” and Workshop (W2) on “*Climate change projections for marine ecosystems: Best practice, limitations and interpretations*”, and Dr. Kyung-Ryul Kim (AP-CREAMS) was a general plenary speaker on “*Recent advances in studies for East Sea (Sea of Japan), a miniature test ocean for global changes*” at the 2nd International Symposium on “*Effects of climate change on the world’s oceans*” (May 13–20, 2012, Yeosu, Korea).

AP-CREAMS had an inter-sessional meeting (May 18, 2012, Yeosu, Korea) to discuss national reports and activities. The EAST-II region was extended to include the Yellow Sea. A supplementary chapter of the second North Pacific Ecosystem Status Report (PICES Special Publication No. 4, 2010) developed by AP-CREAMS and endorsed by Science Board at PICES-2011 was reviewed by MONITOR and AP-SOFE. The reviews identified the areas that need further editing. AP-CREAMS requested a permission to take on the editing themselves along the guidance of MONITOR and SOFE and Science Board approved the request. The Science Board Chairman reminded Science Board that is the chapter was an important document produced by many scientists, and he would make every effort to get it published in time. Science Board was advised that NOWPAP is considering holding another training course on remote sensing in China in 2013 and that NOWPAP would be approaching PICES to be a co-sponsor. AP-CREAMS is planning to propose a CREAMS/PICES Summer School on “*Ecosystem modelling*” in 2014.

The Section on *Carbon and Climate* is supervised jointly by POC and BIO and its activities can be found above under the BIO mid-year report.

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Drs. Emanuele Di Lorenzo and Shoshiro Minobe (WG 27) and Jacquelynne King (AP-COVE) are organizing and international workshop, along with US-GLOBEC and ICES, on “*Forecasting ecosystem indicators with climate-driven process models*” to be held September 8-10, 2012 in Friday Harbor, USA.

Drs. Shoshiro Minobe (WG 27) and Hiroaki Saito (AP-COVE) attended the CLIVAR Pacific Implementation Panel Meeting April 28–29, 2012, in Noumea, New Caledonia, to speak about PICES activities and seek closer collaboration with CLIVAR as it widens its scope on issues relevant to PICES (and IMBER). CLIVAR is co-sponsoring (along with ICES) a Topic Session (S3) on “*Challenges un understanding Northern Hemisphere ocean climate variability and change*” at PICES-2012.

POC supported the seeking affiliate member status for the proposed SCOR Working Group on Surface Waves in Ocean Circulation and Climate System, should it be formed.

POC is sponsoring/co-sponsoring 6 topic sessions and a contributed paper session at PICES-2012. All convenors are in place.

Technical Committee on Monitoring (MONITOR)

MONITOR Chairman, Dr. Hiroya Sugisaki, announced that the second Global Alliance of Continuous Plankton Recorder Surveys (GACS) workshop will take place in Paris, France, in September 2012. Dr. Sonia Batten (AP-CPR) is the Vice-Chair of GACS. The SAHFOS-Japan research program to analyze Western Pacific CPR samples is progressing well. Dr. Sanae Chiba (AP-CPR) is the principal investigator and she was also a speaker and panel member at the international NPAFC-led workshop on “*Explanations for the high abundance of pink and chum salmon and future trends*” co-sponsored by PICES (October 30-31, 2011, Nanaimo, Canada).

MONITOR is continuing its collaboration with ICES GOOS groups. Unfortunately, it could not send a representative to the workshop ICES workshop to “*Define the ocean observing needs for ICES*” held February 29–March 2, 2012 in Copenhagen, Denmark, and former Chairman of SG-ICES GOOS, Dr. Jon Hare, took the responsibility to discuss MONITOR activities in PICES.

MONITOR is co-sponsoring 2 topic sessions at PICES-2012.

MONITOR and AP-SOFE reviewed the supplementary chapter for the second North Pacific Ecosystem Status Report and requested AP-CREAMS to revise the chapter to address some imbalances. MONITOR and SOFE both agreed that the chapter will need a great deal of editing.

Recommendation: Science Board recommends AP-CREAMS to do the editing of the supplementary chapter of NPESR II based on MONITOR’s and SOFE’s recommendations.

Technical Committee on Data Exchange (TCODE)

TCODE Chairman, Dr. Toru Suzuki, attended the Technical Workshop on the IODE Ocean Data Portal February 20–22, 2012, in Oostende, Belgium. He requested the organizers to change the date of the IODE GE-BICH workshop (IOC/IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices), provisionally scheduled for October 15–18, 2012 in Oostende, Belgium, so it would not overlap with PICES-2012.

Besides continuing to support, coordinate, and identify PICES data and information products for MONITOR, FUTURE, and a number of PICES expert groups, TCODE was preparing to register metadata of WG 21’s database on non-indigenous marine and estuarine species in the North Pacific and WG 23’s database on krill.

TCODE is co-sponsoring a topic session at PICES-2012. Ms. Lynn M. deWitt (USA) has replaced Dr. Thomas Royer as TCODE member.

AGENDA ITEM 10

Presentation and discussion of current status of the FUTURE APs

Due to the absence of AP-SOFE Chairman, Mr. Robin Brown, Drs. Thomas Therriault (AP-AICE) and Hiroaki Saito (AP-COVE) felt it appropriate to defer discussion of FUTURE Chairmen rotating off until PICES-2012. In the meantime, Dr. Therriault reported on the general lack of participation by some members of AP-AICE although participation increased nominally at PICES-2011 and substantially (6 of 7 members present) at the FUTURE roadmap workshop preceding this meeting. Dr. Saito informed Science Board that, of the 6 expert groups formed after ISB-2011 and PICES-2011, 4 of them, Working Group on *North Pacific Climate Variability and Change* (WG 27), Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28), and Working Group on *Regional Climate Modeling* (WG 29) were COVE-related, and that the terms of reference for these groups were well aligned with the FUTURE Science Plan and Implementation Plan. Six of 7 AP-COVE members attended the FUTURE roadmap inter-sessional workshop (including one member who attempted to participate using electronic communication). In general, communication with members was satisfactory. Dr. Saito stated that AP-COVE was actively collaborating with the IMBER and CLIVAR programs and with ICES, and presented a list of 24 projects that were taking place in PICES member countries which were COVE-related.

Action: Science Board to discuss FUTURE Chairmen rotation at PICES-2012.

AGENDA ITEM 11

Implementation of Science Board recommendations and Governing Council decisions from PICES-2011

Science Board reviewed the list of recommendations made by Science Board at PICES-2011 in Khabarovsk, Russia, and subsequent decisions by Governing Council. Dr. Makino pointed out that FUTURE needed to be added as a co-sponsor to the MEQ-sponsored Topic Session on “*Social-ecological systems on walleye pollock and other commercial gadids under changing environment: An inter-disciplinary approach*” in Science Board decision 2011/S/1 for the 2012 PICES Annual Meeting.

Action: Secretariat to make sponsor correction.

AGENDA ITEM 12

Status of planning for PICES-2012, Hiroshima, Japan

The Executive Secretary informed Science Board that the venue for the events, the International Conference Center in Hiroshima, was suitable, with the facilities being able to hold 9 parallel events. However, one small logistical problem was that there were 10 meetings scheduled for October 12 and 13, so one meeting will take place at a hotel. POC Chairman, Dr. Chang, voiced his concern about two POC-sponsored topic sessions and a POC contributed paper session running concurrently. Dr. Sugisaki requested the AP-CPR meeting be moved from its current time slot of 18:00 h to Saturday morning or late evening. It was agreed that Dr. Rumrill should not be identified as a co-convenor.

Dr. Sugisaki asked PICES to consider co-sponsoring an international workshop on the “Recruitment of juvenile Japanese eel (*Anguilla japonica*) in eastern Asia” by advertising it on the PICES website and holding it in association with PICES-2012. This would give scientists from PICES countries a chance to attend the workshop while at the PICES Annual Meeting.

Dr. McKinnell proposed a streamlined method of submitting, evaluating, and managing proposals for topic sessions and workshops through the PICES website. It would provide a seamless, transparent, and comprehensive approach and improve the efficiency of evaluating and ranking the proposals. Science Board fully endorsed the pilot, and offered suggestions to improve the proposal submission and evaluation process.

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The pilot will run for one year to evaluate its effectiveness. Submissions for PICES-2013 will close September 7, 2012 followed by a period of about 3 weeks to allow Committee members to evaluate (vote on) proposals. The Secretariat will prepare a table of proposals with rankings by Committee/FUTURE members. Results of voting by other Committees will be available for comparison, and the results of FUTURE AP members will be summarized in the same manner for comparison with the other Committees.

Action:

- Secretariat to move the POC paper session and AP-CPR business meeting to another time slot;
- Secretariat to remove Dr. Rumrill's name from the co-convenor list for the Science Board Symposium (S1) and the FIS/MEQ co-sponsored topic session S9;
- Dr. Sugisaki to provide the names of the convenors and invited speakers of the eel workshop;
- Secretariat to incorporate 'maybe' to the voting choice, to add a comment field to accommodate co-sponsorship by an organization/program, and prepare a table after receiving all proposals.

AGENDA ITEM 13

Capacity building/Plan for PICES summer school in 2013 and beyond

Early Career Scientist conferences

Dr. McKinnell reported that the PICES/ICES Early Career Scientist Conference on "*Oceans of change*" (April 24–27, 2012, Palma de Majorca, Spain), organized with Dr. Adi Kellermann (ICES) was a huge success, with excellent presentations from 130 participants selected from 550 applicants. He presented a general overview of how the past two conferences have been organized, noting especially the benefits of an enthusiastic local organizer, and suggested that since previous conferences have taken place in North America and in Europe, perhaps the next one could take place in Asia. Science Board agreed to defer a decision to the Annual Meeting.

Action: Science Board to discuss an Early Career Scientist Conference to tentatively take place in Asia at PICES-2012.

Training courses and summer schools

Dr. Fangli Qiao announced that China hosted the first successful UNESCO/IOC ODC (Ocean Dynamics and Climate) training course in 2011 in Qingdao. China was prepared to host the next training course on (tentatively) air–sea interaction in 2013 and PICES was invited to be a co-sponsor. Science Board agreed to discuss the proposal at PICES-2012 when more details are known. Dr. Yoo stated that NOWPAP was also planning another training course, and would probably submit a proposal at PICES-2012 as well.

Science Board reviewed plans for a PICES Summer School on "*Ocean observing systems and ecosystem monitoring*" to be held August 2013 in Corvallis, USA. It was agreed that the BIO, POC and MONITOR Committees would nominate two members (one from each side of the Pacific) from their respective Committees or subsidiary bodies to serve on a Scientific Steering Committee to work with the principal school organizers and PICES Secretariat. They would also serve on a Selection Committee to review applications. As Dr. Barth, one of the school's organizers, is also a member of MONITOR, it was suggested he could also serve as MONITOR's representative on the Selection Committee, and MONITOR would just need to nominate one additional member.

Action:

- Dr. Qiao to submit a written proposal for a training course to Science Board for discussion at PICES-2012.
- Drs. Tsuda, Chang and Sugisaki to discuss with their respective Committees scientists to serve on the PICES Summer School selection committee and submit nominations to the Secretariat by June 18.
- Secretariat to contact PICES Summer School organizer, Dr. Barth, to inquire what level of funding will be required of PICES.

Potential training courses

Science Board discussed the possibility of PICES running its own capacity building program, similar to that of ICES. Members were reserved in their support, citing travel costs and lack of PICES experience in this field as two issues. To understand what is entailed in starting up and running such a program, it was suggested that PICES inquire about ICES' experience at PICES-2012, and then form a study group to look at the feasibility.

Action: Secretariat to contact Dr. Adi Kellermann to prepare a presentation on ICES' training courses for Science Board meeting at PICES-2012.

AGENDA ITEM 14

PICES Visiting Scientist Program

F&A Committee Chair, Ms. Patricia Livingston, presented a brief overview on the establishment of a PICES Visiting Scientist Program, approved by Governing Council in 2001. The expectation was that the Program would commence in 2002 and would be closely linked to the development of the North Pacific Ecosystem Status Report, but PICES never advertised for a Visiting Scientist and the Program fell dormant. With the implementation of the FUTURE program, the plan is to resurrect the Program to provide resources to help develop FUTURE products. Science Board was receptive to the idea, and discussed such issues as defining explicit tasks, to how to advertise the opening, and who or what agencies to direct it to.

Action:

- Ms. Livingston to revise wording for the Program posting
- Science Board to draw up a list of tasks and products

AGENDA ITEM 15

Wooster and POMA awards

Science Board met *in camera* to select the 2012 Wooster Award recipient (two nominations with one rolled over from 2011) and to evaluate recommendations from MONITOR and TCODE for the 2012 PICES Ocean Monitoring Service Award (POMA; no new nominations; three rolled over from 2011). The recipient for each award will be announced at the Opening Session of PICES-2012 in Hiroshima, Japan. Remaining nominations for the POMA will be rolled over to 2013 for consideration at the next inter-sessional Science Board meeting

AGENDA ITEM 16

Election of Science Board Chairman-elect

Science Board reviewed the criteria for electing a Science Board Chairman one year in advance of his/her taking office (termed Science Board Chairman-elect). Although it is not mandatory to have a Chairman-elect, the rationale for having one is to facilitate the continuity of Science Board business by giving the incoming Science Board Chairman the opportunity to understand the job. Dr. Yoo's 3-year term will be up in 2013. The nominee can be any scientist from PICES member countries. Nominations must be received by the Executive Secretary at least 60 days prior to the beginning of the Annual Meeting where the election will occur.

Action:

- Secretariat to advertise for nominations for Science Board Chairman-elect position
- Science Board to vote for Science Board Chairman-elect at PICES-2012

ISB-2012

AGENDA ITEM 17

Venue and dates of ISB-2013 and potential concurrent workshops

Science Board agreed to accept Russia's invitation to have an inter-sessional Science Board meeting in 2013. Venues in eastern and western Russia were discussed. The latter would provide an opportunity to hold a joint PICES/ICES workshop to stimulate activity under the new Framework for PICES-ICES Scientific Cooperation.

Action:

- Secretariat to communicate with Russian contacts to set the venue
- Drs. Yoo and Anne Hollowed to discuss a workshop theme and topics with ICES colleagues

AGENDA ITEM 18

Possible PICES-sponsored conferences/symposia in 2013 and beyond

Expert groups that will organize future symposia

Dr. Makino informed Science Board that he would discuss setting a date for a symposium organized by S-HD at its first meeting at PICES-2012. It was pointed out that PICES would likely be co-sponsoring the 3rd Symposium on "*Effects of climate change on the world's oceans*" in 2016 to be tentatively hosted by the Oceanographic Institute of the Universidade de São Paulo, Brasil (see Agenda Item 5c).

FUTURE Open Science Meeting

Science Board agreed to set 2014 as the date to hold a FUTURE Open Science Meeting. This will allow an opportunity to get input from outside of PICES on filling any gaps and making corrections before final FUTURE products are produced.

Action:

- FUTURE AP Chairmen and Science Board Chairman to consider meeting topics for discussion at PICES-2012;
- Secretariat to look for an OSM venue.

AGENDA ITEM 19

Status of PICES-2013, Canada theme and venue

The Executive Secretary told Science Board that Canada will host PICES-2013 in Nanaimo, Canada, from October 11–20, 2013. The venue is the newly constructed Vancouver Island Conference Centre. There are minor concerns about accommodation that still needed to be addressed, as there is only one large hotel near the venue.

It is the responsibility of Science Board to determine a theme for scientific activities at each Annual Meeting. At PICES-2011, Canada submitted its views on a suitable theme for PICES-2013 in a document entitled "communicating forecasts, uncertainty and consequences of ecosystem change to society". As Science Board had not discussed or developed a draft theme prior to the intersessional meeting, and because there was insufficient time remaining to develop a theme in Busan, a delay was becoming apparent. To stimulate discussion, Dr. McKinnell volunteered to prepare a draft immediately after the inter-sessional meeting and circulate it to Science Board.

Action: Dr. McKinnell to prepare a draft for the PICES-2013 theme and circulate to Science Board for comments by the end of May.

AGENDA ITEM 20

Committee Action Plans

Due to lack of time, Dr. Yoo recommended that Committee/FUTURE Chairs circulate their draft Action Plans within their respective Committees for review and comments and then send them to Science Board for final review prior to PICES-2012.

Action:

- Committee/FUTURE Chairs to circulate their respective Action Plans to their members for comments before submitting them to the Secretariat for inclusion in the Science Board briefing book.

AGENDA ITEM 21

Other business

none

ISB Endnote 1

Science Board participation list

Members

Kyung-Il Chang (Chairman, POC)
 Libby Logerwell (Chair, FIS)
 Fangli Qiao (Representative of the People's Republic of China)
 Hiroaki Saito (Chairman, AP-COVE)
 Igor Shevchenko (Representative of Russia)
 Hiroya Sugisaki (Chairman, MONITOR)
 Thomas Therriault (Chairman, AP-AICE)
 Atsushi Tsuda (Chairman, BIO)
 Sinjae Yoo (Chairman, Science Board)

Invitees

Harold (Hal) Batchelder (AP-SOFE)
 Patricia Livingston (F&A)
 Mitsutaku Makino (MEQ; S-HD)
 Ian Perry (WG 28, S-HD)
 Hiroyuki Shimada (F&A)
 Vera L. Trainer (S-HAB)
 Mark Wells (S-HAB)
 Ungyul Yi (observer, Korea)

Other

Lev Bocharov (PICES Chairman)
 Alexander Bychkov
 Skip McKinnell
 Rosalie Rutka

ISB Endnote 2

Science Board meeting agenda

Thursday, May 24, 2012 (14:00 – 18:00)

1. Welcome and adoption of agenda (Yoo)
2. Expert groups with issues (All)
3. Interactions with other organizations (All)
4. Status of proposed publications (Secretariat)
5. Status of proposed inter-sessional workshops/symposia (All)

ISB-2012

Friday, May 25, 2012 (09:00 – 18:00)

6. Expert groups with issues (continued, All)
7. Report on newly formed expert groups (Co-Chairs of expert groups)
8. New PICES/MAFF project: Objectives and implementation strategy (Perry/Makino)
9. Mid-year reports from Scientific and Technical Committees (Committee Chairs)
10. Presentation and discussion of current status of the FUTURE APs (AP Chairs)
11. Implementation of Science Board recommendations and Governing Council decisions from PICES-2011, Khabarovsk (Yoo)
12. Status of planning for PICES-2012, Hiroshima, Japan (Secretariat)
13. Capacity building/Plan for PICES summer school in 2013 (Yoo)
14. PICES Visiting Scientist Program (Livingston)
15. Wooster and POMA awards (All)
16. Election of Science Board Chairman-elect
17. Venue and dates of ISB-2013 and potential concurrent workshops (Yoo)
18. Possible PICES-sponsored conferences/symposia in 2013 and beyond (All)
19. Status of PICES-2013, Canada theme and venue (Secretariat)
20. Committee Action Plans (Committee Chairs)
21. Other business

Report of Science Board

Science Board met in Hiroshima, Japan from 12:30-14:00 on October 14, 2012, to set the agenda and discuss the items set for the luncheon meeting. Science Board Chairman, Dr. Sinjae Yoo, welcomed members and guests, Dr. Yutaka Michida from the Intergovernmental Oceanographic Commission (IOC) and Dr. Satoru Taguchi from the Scientific Committee on Oceanic Research (SCOR) to the meeting (*SB Endnote 1*) after calling it to order. The second day of the meeting was held after the Closing Session from 15:00–18:00 on October 19 with invited guests Dr. Adolf Kellermann (ICES) and Dr. Lisa Miller (SOLAS) attending. Due to the complexity of issues and lack of time, the agenda item on status of proposed inter-sessional workshops/symposia and majority of FUTURE SSC agenda items were deferred for discussion to the third day of meeting, held from 8:30–18:00 on October 20. The revised meeting agenda can be found in *SB Endnote 2*.

Sunday, October 14, 2012

AGENDA ITEM 2

Procedures for Science Board Symposium, awards, and Closing Session

Procedures for judging presentations by Early Career Scientists were discussed briefly. Some confusion arose concerning the eligibility of workshops (which proceed the week of topic sessions). Science Board agreed that any presentations made by early career scientists at workshops would be eligible. It was confirmed that all Science Board members were responsible for evaluating the Best Oral and Poster presentations for the Science Board Symposium and reporting the outcome to the Science Board Chairman. Topic session and workshop convenors are responsible for preparing summary reports and the Science Board Vice-Chairman will prepare a summary of the Science Board Symposium.

AGENDA ITEM 3

Relations with specific international programs/organizations

Dr. Yutaka Michida (IOC Vice-Chairman) discussed the background and mission of IOC, and its objectives and challenges. With the world economy in financial crisis, Dr. Michida noted that IOC was also facing financial difficulties. IOC is expected to reduce its budget by 70% effective immediately. However, he felt that IOC would meet its budgetary commitments where it had been identified as a co-sponsor of an upcoming event. WESTPAC is a sub-commission of IOC, and would most likely be able to make contributions to co-sponsored events. He reflected on past WESTPAC-PICES cooperation, citing joint workshops and symposia that have taken place, as well as joint training, *e.g.*, through S-HAB, the sharing of oceanographic data and information, *e.g.*, IODE, and collaboration in ocean observing systems, *e.g.* NEAR-GOOS. In addition, Korea provided a budget from a Korean trust fund to IOC for joint workshops and research on ocean acidification which is expected to be funnelled into its area of interest (*i.e.*, the North Pacific). Currently it has four high-level objectives that correspond to the major challenges facing the oceans: (1) prevention and reduction of the impacts of natural hazards, (2) mitigation of the impacts of and adaption to climate change and variability, (3) safeguarding the health of ocean ecosystems, and (4) management procedures and policies leading to the sustainability of coastal and ocean environment and resources. Dr. Michida was particularly interested in hearing any PICES ideas concerning ocean hazards.

Dr. Satoru Taguchi (SCOR Vice-President) discussed ongoing cooperation between SCOR and PICES, citing support for SCOR activities, including capacity building, and vice versa. He viewed very positively the way PICES and SCOR have worked out ways to cooperate that have made it possible to share strengths and he indicated that it would be appropriate for both organizations to continue the kinds of cooperation that have been beneficial in the past. To further strengthen collaboration, Dr. Taguchi suggested that PICES should be invited to co-sponsor sessions focused on the North Pacific region when SCOR conducts meeting or other

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activities that can be easily regionalized. PICES should consider contributing to SCOR capacity building activities beyond the support that PICES already gives for some meetings, e.g., contributing to the SCOR Visiting Scholars program, POGO-SCOR fellowships; PICES could propose and co-fund SCOR working groups.

Actions and outcome from ISB-2012 on interactions with other organizations were reviewed.

Friday, October 19, 2012

AGENDA ITEM 4

Relations with specific international programs/organizations (continued)

The International Council for the Explorations of the Sea (ICES) was represented by Dr. Adolf Kellermann (Head, ICES Science Program) who informed Science Board that ICES was about to undergo major structural changes, which included the development of a new Science Plan in 2013. A new Strategic Initiative for ICES was the teaming of the Marine and Maritime Science and Technology Forum with the maritime industry. Dr. Kellermann invited PICES to co-sponsor a number of symposia in 2013/14, most of them fishery-related. FIS Chair, Dr. Libby Logerwell was given the opportunity to identify tentatively the top two that would be of interest to FIS and FUTURE: ICES Symposium on “*Effects of fishing on benthic fauna and habitat: Change in ecosystem composition and functioning in response to fishing intensity, gear type and discard*” (May 2014, Tromsø, Norway) and Symposium on “*Ecological basis of risk analysis for marine ecosystems*” (June 2014, Helsinki, Finland).

Dr. Kellermann gave an overview of the ICES experience with their new training programme (see Agenda Item 19 of the 2012 inter-sessional Science Board meeting report in the [2012 Annual Report](#)).

SOLAS observer, Dr. Lisa Miller, described the particulars for a 6th SOLAS Summer School to be held from August 23 to September 2, 2013, in Xiamen, China. SOLAS asked PICES to co-sponsor the event by providing travel funds for 3 students/early career scientists from PICES member countries, as was done for the previous summer school in Cargèse, Corsica, in 2011.

Dr. Miller expressed her appreciation to Science Board for nominating her as an affiliate member of SCOR Working Group 140 on Biogeochemical Exchange Processes at the Sea-Ice Interfaces, and briefly described the tasks the WG intended to address. Her affiliate status has still not been officially approved, but did not see a problem with its acceptance. The Group’s first formal meeting will take place either in November (by teleconference) or in the spring of 2013.

AGENDA ITEM 5

Report on MAFF Project

Dr. Mitsutaku Makino reported on the first meeting (October 11 at PICES-2012) of the PICES-MAFF Project on Marine Ecosystem Health and Human Well-Being. The meeting was chaired by the principal investigators Dr. Ian Perry and Dr. Makino. The project team identified 5 potential areas for integration with other PICES activities. The team was able to draw on the experience of S-HAB work of the previous MAFF-funded project (Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim) for ideas, and an approach using project tools to do an integrated social-ecological assessment will be applied to 3 test countries (Indonesia, Guatemala and Palau). Timelines have been established to refine a 3D “cube of well-being” in which a person (community, region, etc.) can be selected from one or more cells defined by a specific category specified by each axis, refine and select specific objects and approaches for the project, set up a project web site for project team members, prepare a draft questionnaire for the first target country and the first scoping meeting/workshop with its representatives. The team hopes to conduct its first workshop, possibly in conjunction with ISB-2013. In the meantime, the team was looking at ways to engage China and Russia in order to include potential members.

FUTURE SSC AGENDA ITEM 6

Presentation and discussion of FUTURE Advisory Panel current status

AP-AICE Chairman, Dr. Thomas Therriault, reported on poor attendance at the AICE meeting leaving some member countries and Committees unrepresented. He recommended that because the AICE mandate is so broad, additional members will be needed. His preference for selecting additional members was firstly to ensure comprehensive representation by Committees and thereafter to seek to balance national representation.

Dr. Therriault noted that the development of a common FUTURE presentation, and holding the joint AP meeting before the individual AP meetings seemed to strengthen the relationship between the Advisory Panels and Committees. However, communication still needed to be improved in the sense that the Advisory Panels were not getting feedback from Committees, as the APs meet prior to the Committee meetings. Therefore, more Committee and expert group members should be encouraged to attend the joint FUTURE Advisory Panel meeting at future PICES Annual Meetings.

AP-COVE Chairman, Dr. Hiroaki Saito, reported that 6 of 7 members attended their meeting. COVE reviewed the reports of WG 27, WG 28, S-CCME and S-CC, and noted that events for these expert groups were going smoothly. Dr. Saito noted that although S-CCME was very active, there was some overlap with other expert groups, and instructed the S-CCME Co-Chairs to communicate better with the other groups and with the FUTURE APs. He also agreed with AICE that more Committee and expert group members should be involved in the FUTURE AP meetings.

AP-SOFE Chairman, Mr. Robin Brown, announced that meeting participation was generally good (except by China), but that participation by email between meetings was generally poor. Although engagement with Committees was still limited, it was getting better and a FUTURE roadmap would help decrease the communication gap.

Changes in chairmanship/membership

See Agenda Item 12.

Online submission of topic sessions/workshops

The FUTURE Advisory Panels viewed the new online submission and evaluation system favourably and considered it to be an advancement in streamlining the selection of topic sessions and workshops for PICES Annual Meetings. To further improve the process, it was suggested that more reminders from the Secretariat on submissions and rankings be implemented, that more information on the number of invited speakers (and expected financial obligations) be included, and that rankings by individuals should not be disclosed.

Action: Secretariat to update the online system before opening it for proposals for PICES-2014.

FUTURE roadmap (see Table 1)

AICE found that the topic of ecosystem resilience and vulnerability was a challenge to link into the FUTURE roadmap. WG 28 was starting to include elements of this topic but AICE felt it would be worthwhile to establish a study group to focus on the ecosystem indicators. SOFE suggested that Governing Council be enlisted to help identify stakeholders for outreach products and to share this information with S-HD.

The plan and strategy for developing the next North Pacific Ecosystem Status Report (NPESR III) was discussed at the AP meetings. It was agreed there was a need to identify critical environmental data needs early, and a mechanism to ensure they will be available, *i.e.*, WG 28 can provide ecosystem indices during its lifespan, but there will need to be a process in place to maintain them.

Action: SOFE to work with WG 28 to identify ecosystem indicators and with S-HD to identify socio-economic indicators. SOFE to recommend a process for reporting indicators after WG 28 is disbanded.

SB-2012*FUTURE Open Science Meeting (OSM)*

It was agreed that to remain relevant to the scientific community, the organizers of the OSM should encourage participation by other organizations and identify topic sessions to co-convene with other organizations. COVE emphasized that the next generation of scientists needed to be involved in FUTURE to see the program through. One way would be to have a social event incorporated into the meeting giving early career scientists (ECS) an opportunity to network; another way would be to have an ECS co-convene one or more topic sessions. For details of the OSM, see FUTURE SSC Agenda Item 9.

Table 1. FUTURE roadmap, October 2012

Products		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Knowledge					Indicators of cumulative stresses [WG28]							
			core indicators of EBM [WG19]		Characteristics of NP Indices in modern models [??]							
Status			NPESR 2				NPESR (web)	NPESR 3*	NPESR (web)	NPESR (web)	NPESR (web)	NPESR 4
				NIS Atlas/DB								
Forecast /outlook					distribution shift of marine organisms [S-CCME]							
					MLD/circulation projections [WG29]							
					CMIP5 Analysis/Derived Vars [WG29]							
					Jellyfish outbreak [WG26]							
				Cohen Commission Report								
Outreach					Press release-FUTURE activities [SOFE]							
					Hot topic updates [SOFE]							
					Newsletters/briefing of S-HD and S-CCME							
					Wikipedia updates [TCODE]							
					climate index portal [TCODE]							
					Education materials to engage early career scientists in PICES							

* Governing Council approved the activities and timelines of the FUTURE roadmap proposed by Science Board with a caveat to the suggested timeline for delivering the next edition of the North Pacific Ecosystem Status Report (NPESR 3) “under the condition that NPESR 2 is fully completed”.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Engagement strategy											
				Identify and contact with users with trial products, develop strategy [S-HD] - Preliminary		Identify and contact with users with trial products, develop strategy [S-HD]					
ExGs											
	S-HAB			S-HAB							
Sections	S-CC		S-CC								
				S-CCME							
				S-HD							
		WG 26									
			WG 27				Regional Ocean Climate Model Inter-comparison ?				
WG			WG 28				Coastal Ecosystem modeling ?				
				WG 29			?				
					WG-Marine Pollution						
					Ecosystem Resilience?						
SG				SG-MP							
Events											
				Climate effects 2		FUTURE OSM	Climate effects 3	CCME Symp	HD Symp	FUTURE Synthesis	
Symposium											
		Kick-off WS	Indicator WS	Roadmap WS	Distr. shift WS	Mid-term Evaluation					
FUTURE WS			RCM WS ₁		RCM WS ₂						
IPCC						AR5					AR6?

Saturday, October 20, 2012

FUTURE SSC AGENDA ITEM 7

Status of new expert groups

The status of the Section on *Human Dimensions*, Section on *Climate Change Effects on Marine Ecosystems*, Working Group (29) on *Regional Climate Modeling*, and Study Group on *Marine Pollution* were presented at the joint FUTURE Advisory Panel meeting (October 14, 2012). The reports of these groups can be found elsewhere in the [2012 Annual Report](#).

FUTURE SSC AGENDA ITEM 8

FUTURE inter-sessional workshop

Science Board supported the S-CCME proposal for an inter-sessional FUTURE joint PICES/ICES workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*” to take place in conjunction with ISB-2013. Both are tentatively scheduled for St. Petersburg, Russia during the 4th week of May 2013. It was noted that although S-CCME was very energetic and worked closely with ICES, there was a lack of communication with FUTURE and PICES expert groups resulting in *e.g.*, some duplication in activities.

Recommendations:

- appoint a S-CCME member to a FUTURE Advisory Panel;
- have S-CCME present its report at the joint FUTURE AP meeting instead of at the Committee-level;
- have a common S-CCME presentation to distribute to the Committee meetings.

Action: Science Board Chairman to ask S-CCME to enhance communication with FUTURE APs on decisions.

FUTURE SSC AGENDA ITEM 9

FUTURE OSM 2014

The FUTURE Advisory Panels supported the central location of Honolulu, Hawaii, for the FUTURE Open Science Meeting in April 2014. Science Board agreed that the meeting would span 4 days and would be structured around the 4 research themes, including FUTURE current status and perspectives. The purpose would be to evaluate the progress made midway through the lifespan of the Program and make any necessary adjustments to bring the Program back to its implementation objectives. The format of the meeting would be plenary sessions and breakout groups; panel discussion at the end of each day. The meeting would be followed by a 1-1.5 day meeting in which a small team would put together an evaluation report. Papers from the OSM will be published in a special issue of a peer-reviewed scientific journal. Timeline for a preliminary announcement to be sent to Committees for feedback will be early December, to be finalized January 1, 2013 by the OSM SSC composed of the FUTURE AP Chairs, Science Board Chairman, and S-HD Co-Chairman, Dr. Makino.

Actions:

- SSC to circulate a preliminary OSM announcement to Committees and their expert groups for feedback by early December, 2012.
- SSC to finalize first announcement by January 1, 2013 and send by January 13, 2013.

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FUTURE SSC AGENDA ITEM 10

Other FUTURE matters

The FUTURE roadmap that was originally presented at the joint FUTURE Advisory Panel meeting on October 14, was updated to reflect the input at that meeting (See Table 1). Dr. Yoo will present it to Governing Council on October 21. Dr. Chang noted that it was premature for POC WG 27 and 29 to identify and contact users with trial products since these two Working Groups were just established. In addition, he emphasized a need to form a working group on end-to-end modelling so that the upper trophic levels could also be modelled.

AGENDA ITEM 11

Status of proposed inter-sessional workshops/symposia

Science Board reviewed the 2011–2012 Standing List of International and Regional Organizations and Programs. The list is used by the Secretariat as a guide in making decisions about participation in meetings of other organizations. No additions or removals were recommended. The Arctic Climate Impact Assessment (ACIA) is slated to be removed from the list in 2013, but it was noted that ACIA was in the middle of an ocean acidification review process, which might be relevant to PICES.

At the Executive Assembly of the IOC, the government of Brazil offered to be the host the 3rd IOC/ICES/PICES International Symposium on “*Effects of climate change on the world’s oceans.*” Science Board discussed the idea and agreed, in principle, for PICES to co-organize the event. The venue and date still need to be determined.

Science Board agreed to co-sponsor IMBER’s IMBIO III on “*The future of marine biogeochemistry, ecosystems and societies*” to be held January 28–31, 2013, in Goa, India, at the same level as for IBIZO II in 2010. It was noted that IMBER intends to hold an Open Science Conference in June 2014, which will potentially conflict with the draw for FUTURE’s Open Science Meeting scheduled for April 2014.

A Phase II Open Science workshop on climate change HAB issues, to be co-sponsored by IOC and SCOR, is scheduled for spring of 2014. Science Board felt it important to keep SCOR and IOC informed of our event and to encourage their scientists to attend FUTURE’s meeting. Science Board agreed to co-sponsor the Phase I workshop on “*Harmful algal blooms in a changing world*”, in spring 2013, in Friday Harbor, USA (see Agenda Item 12, under priority items with funding implications).

AGENDA ITEM 12

Reports from Scientific and Technical Committees

Brief highlights of Committee activities and plans were provided by their Chairs. Detailed reports of each Committee can be found in the [2012 Annual Report](#).

BIO

BIO Committee Chairman, Dr. Atsushi Tsuda, reported that:

- Dr. William Peterson was nominated to be a BIO member of SOFE;
- AP-MBM member, Dr. Hirohito Kato, requested that IWC be asked to include a seabird observer in the POWER cruise in the North Pacific;
- NPRB representative, Dr. Francis Wiese, invited PICES scientists to suggest topics for a NPRB Bering Sea Project study;
- MEMIP progress has been slowed because of lack of computer availability for running models;
- BIO strongly recommended PICES to make a statement against the commercial dumping of iron sulphate in a fertilization experiment [later found to be a fine dirt-like substance with trace amounts of iron in it] that took place 300 km off Haida Gwaii (west coast of Canada).

Recommendation: Science Board recommends that BIO and MEQ draft an appropriate statement, based on PICES expert group publication evidence, to be presented to Governing Council.

FIS

FIS Committee Chair, Dr. Elizabeth Logerwell, recommended that a joint PICES-NPAFC study group be formed at PICES-2013 to look at a framework for establishing scientific linkages between the two organizations. Science Board enthusiastically supported the idea. FIS received a WG 24 final report from WG Co-Chairman, Dr. Brett Dumbauld. The section from China was not received despite the efforts of Dr. Fangli Qiao to encourage China's contribution. The report will be reviewed by a FIS and MEQ subgroup before submitting to the Secretariat for publication. A special PICES seminar on environmental data availability and modelling capabilities, and possible techniques for incorporating this information in ISC (International Scientific Committee to study the tuna and tuna-like species of the North Pacific Ocean) stock assessments, will take place at ISC₁₃ in July 2013 in Korea.

Action:

- Secretariat to develop, jointly with NPAFC, motivation, terms of reference and list of potential members for a PICES-NPAFC study group for review at ISB-2013;

MEQ

Acting Chairman, Dr. Mitsutaku Makino, reported that the lifespan of Working Group on *Non-indigenous Aquatic Species* (WG 21) ends at PICES-2012, but that the Working Group indicated it wanted to continue its activities in another capacity such as a new Section, Working Group, Advisory Panel, or in collaboration with the Study Group on *Marine Pollution*. In this regard, WG 21 requested a 1-year extension to finalize the new terms of reference for the above options. Dr. Makino recommended that WG 21 align its TORs with MEQ's Action Plan once the Committee revises it.

The Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24) submitted its final report to MEQ and FIS without a country report from China. Its final meeting before disbanding was held on October 13. Members recognized that environmental research on aquaculture is still important to PICES, and recommended that the topic be included in MEQ's revised Action Plan, and be closely coordinated with FIS.

The Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28) continues to be active. The WG has constructed a web-based questionnaire to be completed by experts on habitat vulnerability and stressors.

The Section on the *Ecology of Harmful Algal Blooms* (S-HAB) successfully organized local HAB centers in the Philippines, Guatemala and Indonesia under a PICES/MAFF Seafood Safety Project supported by a grant from the Fisheries Agency of Japan. S-HAB has identified potential contributions and links to a new PICES-MAFF project (see Agenda Item 5) and has, therefore, revised its terms of reference. The new TORs will be discussed by Science Board only after MEQ has revised its Action Plan, to be reviewed at ISB-2013. S-HAB requested new members, Chunjiang Guan (China), Douding Lu (China), Chang Hoon Kim (Korea) and Stephanie Moore (USA) be added to the Section.

The Study Group on *Marine Pollution* (SG-MP) proposed a new Section on Emerging Topics in Marine Pollution. Because MEQ has not completed a revision of its Action Plan, Science Board advised that it was too early to establish a new expert group and recommended that MEQ have its revision completed by ISB-2013 in order for SG-MP to complete its final report for submission at PICES-2013.

Dr. Chuanlin Huo (China) submitted a proposal for a new Working Group on the Assessment of Marine Environmental Quality of Radiation around the North Pacific. Following discussion, Science Board agreed on the need to establish a Study Group to examine the need for a Working Group. The terms of reference were revised during the Science Board meeting by Dr. Huo (then MEQ Chairman-elect) with help from the Secretariat. Dr. Huo informed Science Board that the State Oceanic Administration of China was prepared to host an inter-session workshop for Study Group members (if endorsed by Governing Council) to discuss how

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such a Working Group will relate to other PICES expert groups and to refine terms of reference for the proposed Working Group. If the Study Group proposal is not endorsed by Council, the workshop will still proceed, but with the expectations of forming a Study Group at a later date.

Executive Secretary, Dr. Alex Bychkov, explained the procedures for electing a Committee chairman, and conducted the election. Dr. Chuanlin Huo was elected as the Chairman of MEQ. MEQ will form a task team to develop a draft revised Action Plan for review at ISB-2013, based on keywords submitted by MEQ members.

Recommendations:

- extend WG 21 for 1 year to work on new terms of reference;
- extend SG-MP for 1 year to complete its final report and recommendations;
- extend S-HAB for 1 year to revise its terms of reference;
- establish a Study Group on *Developing Radionuclide Science in the North Pacific Ocean*.

Action: MEQ to include environmental research on aquaculture in its Action Plan

POC

POC Committee Chairman, Dr. Kyung-II Chang, informed Science Board that the special issue of selected papers on modelling from the 2011 ESSAS Open Science Meeting, dedicated to the late Dr. Bernard Megrey, was switched from the *Journal of Marine Systems* to *Progress in Oceanography* due to the lengthy publication queue of the former journal. Publication is expected after 2013.

The Section on *Carbon and Climate* (S-CC) opened its PACIFICA database in May 2012 and a unified data product will be opened at the end of 2012. S-CC may request financial support to document PACIFICA data activities. The details may be presented at ISB-2013 or PICES-2013.

AP-CREAMS is considering a special publication on the EAST-II project based on data collected during cruises. It will be discussed at the 6th PEACE (Program of the East Asian Cooperative Experiment) workshop in Nagoya, Japan in November 2012. A report will be presented at ISB-2013. AP-CREAMS proposed a 4th PICES Summer School on “*Ecological modelling*” to take place in Seoul, Korea, August 2014. A NOWPAP/PICES/IOC-WESTPAC training course on remote sensing data analysis is being proposed for 2013, to take place in China (see Agenda Item 19 for more details on the summer school and training course). The supplementary chapter to NPESR II was revised and re-submitted to MONITOR and AP-SOFE for review.

Actions:

- S-CC to develop a proposal for funding to document PACIFICA data activities.
- POC to report on AP-CREAMS’s activities at November 2012 workshop at ISB-2013.
- At ISB 2013, POC to report on dates, venue, and organizers of PICES-2014 summer school at ISB-2012.

MONITOR

Chairman, Dr. Hiroya Sugisaki, noted that there was no Korean member at the MONITOR meeting this year. A Chinese member attended after a 5-year absence, but only for MONITOR’s overture meeting on October 14. Dr. Sugisaki’s description of MONITOR–AP-CREAMS activities was similar to that reported in Dr. Chang’s POC report (see previous section).

AP-CPR continues to be active. A second GACS (Global Alliance of CPR Survey) workshop will take place in September 2013 in Paris, France. GACS Vice-Chair and AP-CPR member, Dr. Sonia Batten will attend. Principal Investigator, Dr. Sanae Chiba reported that the research program on the analysis of Western Pacific CPR samples was proceeding well. Funding for the Pacific CPR program is assured through 2013. Plans are to approach NPRB for funding for 2014. Dr. Sugisaki noted that Dr. Jon Hare, Co-Chairman of ICES/WKOOI (Workshop to Define the Ocean Observing Needs for ICES), reported on PICES/MONITOR activities during their workshop from February 29–March 2, 2012, as PICES did not have a representative at the workshop.

TCODE

Chairman, Dr. Toru Suzuki, described several changes in TCODE membership (see below). No new nominations for POMA were submitted in 2012 so 3 existing nominations will be rolled over to 2013. Dr. Suzuki encouraged Committee Chairs to discuss with their members ideas for new nominations. TCODE is continuing to support registration of metadata from PICES expert groups and to cooperate with other data management groups and activities, *i.e.*, ICES Data Management Group (DIG; formerly known as WGDIM) and IODE OBIS/ODP/GEBICH.

Additional Science Board recommendations

As a result of further discussions at the meeting, a summary of Science Board recommendations to Governing Council is provided below.

Changes in chairmanship

- Dr. Thomas Therriault (Canada) elected as Science Board Chairman-elect;
- Dr. Phillip Mundy (USA) replaces Mr. Robin Brown (Canada) as AP-SOFE Chair;
- Dr. Chaunlin Huo (China) replaces Dr. Steven Rumrill (USA) as MEQ Chair;
- Ms. Darlene Smith (Canada) replaces Dr. Mitsutaku Makino (Japan) as MEQ Vice-Chair.

Changes in membership

- Dr. Amya Dunham (Canada) replaces Dr. Laura Richards as FIS member
- Dr. Zhenya Song (China) replaces Dr. Zhanhui and Dr. Lei Zhou (China) replaces Dr. Dake Chen as POC members
- Ms. Lynn M. DeWitt (USA) replaces Dr. Thomas Royer; Mr. Graham Gillespie (Canada) replaces Dr. Colin Wallace; Mr. Jinkun Yang (China) replaces Mr. Runguang Yin; Dr. Joon-Soo Lee (Korea) replaces Dr. Kyu-Kui Jung as TCODE members
- Dr. Vladimir Kulik (MONITOR) to replace Dr. Young Jae Ro (MONITOR) as AP-AICE member
- Dr. Mingyuan Zhu (BIO, China) to replace Dr. Song Sun as AP-AICE member
- Dr. William Peterson (USA) to replace Mr. Wang (China) as AP-SOFE member
- BIO member from Korea to replace Dr. Young-Shil Kang as AP-AICE member
- Dr. Masahide Kaeriyama (AP-AICE) to be replaced by FIS member (TBD) as AP-AICE member

Membership additions

- Drs. Chunjiang Guan (China), Douding Lu (China), Stephanie Moore (USA), Chang Hoon Kim (Korea) to be added to S-HAB
- MEQ member from Japan to be added to AP-AICE membership
- S-HD member to be added to AP-AICE membership
- S-HD member to be added to AP-SOFE membership
- Dr. Lei Zhou (POC) to be added to AP-SOFE membership
- Dr. Jacquelynne King appointed to WG 27 by Governing Council

Groups to be disbanded

- Working Group 24 on *Environmental Interactions of Marine Aquaculture*

Proposed new expert groups

- Study Group on *Radionuclide Science in the North Pacific Ocean*

Extension of existing expert groups

- Working Group 21 on *Non-indigenous Aquatic Species* for 1 year
- Study Group on *Emerging Topics in Marine Pollution* for ½ year

Inter-sessional symposia/sessions/workshops/meetings

Joint theme sessions at the ICES Annual Science Conference, September 23–27, 2013, Reykjavik, Iceland

- *Marine litter*;
- *Future fisheries management – how to account for food-web structure and dynamics* [later renamed to “*Do food web dynamics matter in fisheries management?*”];
- *Responses of living marine resources to climate change and variability: Learning from the past and projecting the future*;
- *Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for the future.*

Symposia/workshops/meetings

- International Symposium on “*Climate variability and change on marine resources and fisheries: Toward a South Pacific Integrated Ecosystem Studies Program (SPICES)*”, January 7–10, 2013, Concepción, Chile (co-sponsored by PICES);
- IMBER IMBIZO III on “*The future of marine biogeochemistry, ecosystems and societies: Multidimensional approaches to the challenges of global change in continental margins and open ocean systems*”, January 28–31, Goa, India (co-sponsored by PICES);
- 5-day PICES/ICES/GEOHAB workshop on “*Harmful algal blooms in a changing world*”, March 18–22, 2013, Friday Harbor, USA;
- 2-day inter-sessional Science Board meeting, May 20–21, 2013, St. Petersburg, Russia;
- 3-day FUTURE joint PICES/ICES workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*”, May 22–24, 2013, St. Petersburg, Russia;
- ICES Symposium on “*Ecological basis of risk analysis for marine ecosystems*”, June 2–6, 2014, Helsinki, Finland (co-sponsored by PICES);
- WG 26 meeting in conjunction with the 4th International Jellyfish Bloom Symposium, June 4, 2013, Hiroshima, Japan;
- 4th International Jellyfish Bloom Symposium, June 5–7, 2013, Hiroshima, Japan;
- a CLIVAR/PICES workshop [later re-developed as theme session] on “*Biophysical interactions*” at the 2nd International Symposium on “*Boundary current dynamics: Its connection with open-ocean, coastal processes, biophysical interactions and responses to global climate change*”, July 8–13, 2013, Li Jiang, China;
- 8th International Conference on Marine Bioinvasions, August 20–22, 2013, Vancouver, Canada (co-sponsored by PICES);
- 3-day workshop on “*Development and application of regional climate models-IP*”, September 3–5, 2013, Busan, Korea;
- FUTURE Open Science Meeting, April 2014, Honolulu, USA;
- 3rd International Symposium on “*Effects of climate change on the world’s oceans*”, spring 2015, Brazil (co-sponsored by PICES, ICES, IOC).

Capacity building

- Fourth PICES Summer School on “*Ocean observing systems and ecosystem monitoring*”, August 19–23, 2013;
- 6th SOLAS Summer School, August 23–September 2, 2013, Xiamen, China (co-sponsored by PICES);
- NOWPAP/PICES training course on “*Remote sensing data analysis*”, fall 2013, Qingdao, China;
- PICES Summer School on “*Ecological modelling*”, August 18–21, 2014, Seoul, Korea.

Priority items with funding implications

PICES-2013, October 11–20, 2013, Nanaimo, Canada

- Invited speakers for Science Board Symposium and Topic Sessions, with the normal allocation of approximately \$5,000 per Committee/Program;
- 1 invited speaker for each of the PICES-2013 workshops.

Inter-sessional events

- 3 invited speakers to attend IMBIZO III on “*The future of marine biogeochemistry, ecosystems and societies*”, January 28–31, 2013, Goa, India;
- 2 North American invited speakers to attend the International Jellyfish Bloom Symposium, June 5–7, 2013, Hiroshima, Japan;
- 1 PICES representative to participate in the ESSAS Annual Science Meeting, January 7–9, 2013, Hakodate, Japan;
- 1 scientist to participate at ISC₁₃ (13th Annual Meeting of the International Scientific Committee for Tuna and Tuna-like Species), July 17–22, 2013, Korea
- 3 scientists to attend Phase I workshop on “*Harmful algal blooms in a changing world*”, spring 2013, Friday Harbor, USA;
- PICES representatives/convenors for joint ICES/PICES theme sessions at ICES ASC, September 23–27, 2013, Reykjavik, Iceland;
- 1 or more early career scientists to attend the 8th International Conference on Marine Bioinvasions, August 20–22, 2013, Vancouver, Canada;
- 2 POC scientists to attend International Symposium on “*Boundary current dynamics: Its connection with open-ocean, coastal processes, biophysical interactions and responses to global climate change*”, July 8–13, 2013, Li Jiang, China;
- 2 invited speakers to attend 2nd RCM Workshop, September 2013, Busan, Korea;
- 1 MONITOR scientist to attend an ICES-GOOS related meeting;
- 3 students from PICES member countries to attend the SOLAS summer school, August 29–September 3, 2013, Xiamen, China;
- support for 1 lecturer and 1 or more students/early career scientists from PICES member countries for a NOWPAP/PICES/WESTPAC training course on remote sensing data analysis, fall 2013, China;

Facilities

- Renew rent of a remote server for PICES TCODE geo-spatial portal site.

Publications

Special issues of primary journals (2013–2014)

- Fisheries Science (2013/14, Guest Editors: K. Criddle, S. Kim, M. Makino, I. Perry, Y. Sakurai, A. Velikanov) – selected papers from the PICES-2012 Topic Session on “*Social-ecological systems on walleye pollock and other commercial gadids under changing environment: Inter-disciplinary approach*”;
- Review paper in a peer-reviewed journal (2013, Guest Editors: TBD) based on the results from the 2013 PICES/ICESGEOHAB workshop on “*Harmful algal blooms in a changing world*”;
- Papers in a peer-reviewed journal (2013, Guest Editors: TBD) based on results from the 2013 PICES/ICES workshop on “*Global assessment of the implications of climate change on the spatial distribution of fish and fisheries*”;
- Progress in Oceanography (2013/14, Guest Editors: T. Ichii, S. McKinnell, M. Seki) – selected papers from the PICES-2012 Topic Session on “*Advances in understanding the North Pacific Subtropical Frontal Zone ecosystem*”;
- Progress in Oceanography (2014, Guest Editors: TBD) – selected papers for a special issue from the PICES-2013 Topic Session on “*Banking on recruitment curves; returns on intellectual investment*”.

PICES Scientific Report series

- Final report of Working Group (WG 21) on *Non-indigenous Aquatic Species* (Editors: D. Smith and V. Radashevsky);
- Final report of Study Group on Marine Pollution (Editor: P. Ross)
- Report of the 2012 GLOBEC/PICES/ICES Workshop on “*Forecasting ecosystem indicators with process-based models*” (Editors: E. Di Lorenzo, A. Miller and S. Minobe).

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AGENDA ITEM 13

Action Plans for Standing Committees and Science Board

It was noted that Action Plans among the Committees lacked consistency, with some being too detailed and others not detailed enough. It was suggested that a link to FUTURE would allow easier comparability. Science Board Chairman instructed the Committee chairmen to update their Action Plans with FUTURE in mind.

Actions:

- Committee Chairs to submit revised Action Plans to FUTURE APs by January 2013;
- Committee Chairs to present Action Plans at ISB-2013 for finalization.

AGENDA ITEM 14

Status of proposed publications

Science Board reviewed the list of proposed publications for 2012 and beyond items needing clarification or changes are discussed here. The final report of WG 24 was discussed in Agenda Item 12 under the FIS and MEQ Committee reports. However, incoming MEQ Chairman, Dr. Chaunlin Huo, announced that he would make a final effort to speak with representatives of MOA to look at the China report status, and try to match the WG report or at least. The report will be finalized with or without the China contribution at ISB-2013. Due to the length of time passed since the publication of the final report of Working Group (WG 19) on *Ecosystem-based Management Science and its Application to the North Pacific*, AP-SOFE reported that it will not pursue the development of a brochure.

Action: Incoming SOFE Chairman, Dr. Phillip Mundy to take over the development of the next version of the North Pacific Ecosystem Status Report.

AGENDA ITEM 15

Visiting Scientist Program

Science Board was receptive to the idea of a Visiting Scientist Program, especially as it will provide resources to help in the development of FUTURE. The following is a list of potential tasks/positions:

- North Pacific Ecosystem Status Report editors,
- assembly of data for NPESR,
- development of outreach products for FUTURE,
- development of a PICES training program,
- assist in a PICES training program,
- assist with management of PICES conferences,
- WG 29 data analysis and forecasts,
- address each question of FUTURE Implementation Plan,
- development of FUTURE outlooks and forecasts,
- provision of one-on-one training, *e.g.*, RCMs.

AGENDA ITEM 16

Election of Science Board Chairman-elect

Dr. Thomas Therriault was elected unanimously and will become Chairman-elect following PICES-2012, while continuing to serve as Science Board Vice-Chairman.

AGENDA ITEM 17
PICES-2013

The theme for PICES-2013 is “*Communicating forecasts, uncertainty and consequences of ecosystem change*” to be held in Nanaimo, Canada, from October 11–20, 2013. The following sessions and workshops were endorsed:

¾-day Science Board Symposium

Communicating forecasts, uncertainty and consequences of ecosystem change

1-day BIO Contributed Paper Session

1-day BIO/FIS Topic Session [co-sponsored by IMBER]

Marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being

½-day BIO/FIS/POC Topic Session

Are marine ecosystems of the North Pacific becoming more variable?

1-day BIO/FIS/MEQ/TCODE/FUTURE Topic Session

Ecosystem indicators to characterize ecosystem responses to multiple stressors in North Pacific marine ecosystems

1-day BIO/POC/TCODE/MONITOR/FUTURE Topic Session

Recent trends and future projections of North Pacific climate and ecosystems

1-day BIO Workshop

Marine bird and mammal spatial ecology

1-day FIS Contributed Paper Session

1-day FIS/TCODE Topic Session

Banking on recruitment curves; returns on intellectual investment [merged with ISC proposal on “Pan-Pacific environmental variability and relationship to tuna/billfish/shark productivity and distributions”]; co-sponsored by ISC]

1-day FIS/FUTURE Topic Session

Science needs for offshore oil and gas development in the North Pacific

1-day FUTURE Workshop

Evaluating tools for assessment of species vulnerability to anthropogenic climate changes

½-day MEQ Contributed Paper Session

½-day MEQ/FUTURE Topic Session

Status, trends and effects of pollutants in coastal ecosystems: Implications for wildlife and humans

1-day MEQ Workshop

Traditional seafoods of the Snuneymux’w First Nation in Nanaimo, British Columbia: Insight into food, social and ceremonial uses

½-day MEQ Workshop

Economic impacts of harmful algal blooms on fisheries and aquaculture

1-day POC Contributed Paper Session

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1-day POC Topic Session [co-sponsored by SOLAS]

The changing carbon cycle of North Pacific continental shelves and marginal seas

1-day PICES/ICES Workshop

Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for the future

1-day MONITOR Topic Session

Towards the development of low-cost cooperative ocean monitoring networks [later renamed as “Cost-effective, cooperative ocean monitoring”]

1-day PICES/ICES Workshop

Comparison of size-based and species based ecosystem models

1-day TCODE Workshop

Client side development for accessing distributed PICES datasets [later renamed as “Tools, approaches and challenges for accessing and integrating distributed datasets”]

PICES-2013 business meetings

- 1¾ days for Science Board;
- 1½-h overture meetings and ½ day for Scientific and Technical Committees;
- ½ day for: FUTURE Advisory Panels: AICE, COVE, and SOFE, preceded by a ½-day joint meeting;
- ¾ day for WG 27;
- 1 day for: S-HD, S-HAB, WG 21, WG 26, WG 28, AP-MBM;
- ½ day for: S-CC, S-CCME, WG 29, AP-CPR, AP-CREAMS.

The planning for PICES-2014 was briefly discussed by Science Board. In keeping with the 6-year rotation of PICES member countries, China would be the next country to host the Annual Meeting. However, it remains unclear if China will be doing so. A decision is expected by the end of November.

AGENDA ITEM 18

Venue and dates of ISB-2013

Science Board agreed to keep the dates of ISB-2013 as May 20–21, 2013 in anticipation of a final decision on the venue in Russia. Confirmation is expected by the end of November 2012.

AGENDA ITEM 19

Capacity building/Plan for PICES summer schools

PICES/ICES Early Career Scientists Conference

The Science Board Chairman instructed Committee Chairs from Asian countries to discuss a potential Asian venue for 3rd ECS Conference to be held in 2017 with their national delegates and to have suggestions.

Action: Asian Committee Chairmen to propose suggestions for the next Early Career Scientist Conference venue at ISB-2013.

PICES Summer School, PICES-sponsored Summer Schools, and PICES-sponsored conference

Science Board reviewed the requests for co-sponsorship from SOLAS and Eur-OCEANS, and agreed to support only the 6th International SOLAS Summer School to be held August 23–September 2, 2013, in Xiamen, China, recommending \$5,000 towards the event. It was agreed that the philosophy and topics aligned

well with PICES interests. Science Board approved, in principle, a plan for AP-CREAMS to convene a PICES Summer School on “*Ecological modelling*” in Seoul, Korea in August 2014. A proposal for an early career scientist conference on “Pacific Ecology and Evolution” to be held in Bamfield, Canada in 2013 was not supported.

Recommendations:

- support for 3 students from PICES member countries to attend the 6th International SOLAS Summer School;
- support for a PICES Summer School on “*Ecological modelling*” in 2014

NOWPAP/IOC-WESTPAC training course

Science Board agreed to support a NOWPAP/WESTPAC training course on remote sensing data analysis to take place in 2013, in China (venue to be decided). A contribution of \$3,000 to support 1 lecturer and 1 student from a PICES member country was recommended.

Recommendation: support for 1 lecturer and 1 student for a NOWPAP/WESTPAC training course on remote sensing data analysis.

AGENDA ITEM 20

Possible PICES-sponsored conferences/symposia in 2013 and beyond

Dr. Makino announced that the S-HD was prepared to organize an international symposium on the study of the human dimensions of marine ecosystems in 2016 in order not to conflict with the FUTURE OSM slated for 2014 and the proposed International Symposium on “*Effect of climate change on the world’s oceans*” to take place in Brazil in 2015. S-CCME’s phase 2 timeline to convene an international symposium will be in conjunction with the Brazil symposium.

AGENDA ITEM 21

PICES 25th Anniversary

The upcoming 25th anniversary of PICES, to take place in 2016 in the United States if there are no deviations from the normal 6-year cycle of rotation among member countries, was discussed by Science Board. To promote the anniversary, several projects were discussed including an updated and better designed website and emphasizing electronic media. Other considerations were the production of an online PICES university text book, compiling a photo archive to capture the major achievements of the Organization, and “polishing” the PICES logo.

Action: Mr. Brown volunteered to serve as a Science Board representative on the group that will work on the anniversary preparations.

AGENDA ITEM 22

Other business

Science Board briefly reviewed Governing Council’s request to revisit PICES’ role on the World Ocean Assessment (UN Regular Process for Global Reporting and Assessment of the State of the Marine Environment) after Science Board declined to pursue it further (see 2012 inter-sessional Science Board meeting report, Agenda Item 3 in the [2012 Annual Report](#)). No PICES member country has offered to host a regional workshop on the North Pacific.

SB Endnote 1

Science Board participation list

Members

Robin Brown (AP-SOFE)
Kyung-Il Chang (POC)
Mitsutaku Makino (MEQ)
Elizabeth Logerwell (FIS)
Hiroya Sugisaki (MONITOR)
Igor Shevchenko (representing Russia)
Toru Suzuki (TCODE)
Thomas Therriault (AP-AICE)
Atsushi Tsuda (BIO)
Sinjae Yoo (Science Board Chairman)
Fengli Qiao (representing China)

Observers

Chuanlin Huo (China)
Adolf Kellermann (ICES)
Yutaka Michida (IOC)
Lisa Miller (SOLAS)
Satoru Taguchi (SCOR)

Secretariat

Alexander Bychkov
Skip McKinnell

SB Endnote 2

Science Board meeting agenda

Sunday, October 14, 2012 (12:30 – 14:00)

1. Welcome and adoption of agenda (Yoo)
2. Review of procedures for Science Board Symposium awards, and Closing Session (Yoo, McKinnell)
3. Relations with specific international programs/organizations (Yoo, international organization representatives)

Friday, October 19, 2012 (15:00 – 18:00)

4. Relations with specific international organizations/programs (Yoo, continued)
5. Report on MAFF Project (Makino)
6. (FUTURE SSC) Presentation and discussion of current status of the FUTURE APs

Saturday, October 20, 2012 (9:00 – 18:00)

7. (FUTURE SSC) Status of new expert groups (All)
8. (FUTURE SSC) FUTURE inter-sessional workshop
9. (FUTURE SSC) FUTURE OSM 2014
10. (FUTURE SSC) Other FUTURE matters (All)
11. Status of proposed inter-sessional workshops/symposia (All)
12. Reports from Scientific and Technical Committees (Committee Chairs)
13. Action Plans for Standing Committees and Science Board
14. Status of proposed publications
15. Visiting Scientist Program
16. Election of Science Board Chairman-elect
17. PICES-2013, Nanaimo, Canada, theme and description, draft schedule of scientific sessions and workshops (All)
18. Venue and dates of ISB-2013 (Secretariat)
19. Capacity building/Plan for PICES summer schools in 2012 and 2013 (Yoo and McKinnell)
20. Possible PICES-sponsored conferences/symposia in 2013 and beyond
21. PICES 25th Anniversary activities
22. Other business

SB Endnote 3**Proposal to establish a Study Group on Radionuclide Science in the North Pacific Ocean****Background**

The widespread application of nuclear science and technology has led to increasing amounts of radionuclides being released directly or indirectly into the ocean. Radioactive pollution is becoming a key issue concerned by marine research scientists, especially when a nuclear accident happens.

A large amount of radioactive contaminant was released into the North Pacific from a recent nuclear accident, and the long half-life radionuclides will stay in the marine environment for a long time and possibly endanger the marine ecosystem or human-being health through food chains. Thus it is very important to monitor the radiation exposure level and assess the effects of radioactive substances on marine ecosystem in the North Pacific waters.

A Working Group was proposed to exchange and share the technologies and experiences on the monitoring of the radioactive contaminants in the North Pacific waters, to assess the relevant effect and radiological risk in waters, to promote public understanding of radiation effects and to encourage the enactment of more reasonable regulations concerning the use of radiation. The proposed terms of reference were:

1. To unify the detecting methods of concerned nuclides in PICES member states;
2. To discuss and implement intercalibration of NIT (Nuclear Isotopic techniques) in PICES member states;
3. To exchange and select the assessment methods of marine environmental quality of radiation (MEQR) among PICES member states;
4. To recommend the reference organism species in the North Pacific waters;
5. To assess the current marine environmental quality of radiation of the North Pacific waters;
6. To compile a list of existing databases of MEQR experts of the North Pacific for academic exchange;
7. To promote collaboration among PICES member states.

To provide an opportunity for greater discussion of the proposal among scientists in PICES member countries, Science Board recommended a Study Group to:

1. Convene a workshop in China to provide a forum for exchange of views among scientists on the idea of developing a scientific focus on understanding the quantities and distributions of radionuclides in the North Pacific;
2. To refine the WG terms of reference proposed by China in consideration of wider interests of scientists in PICES member countries, including relevance to the FUTURE/AICE mandate;
3. To develop a list of potential WG members;
4. To prepare a report with recommendations for future PICES activities and products related to the topic that are consistent with new MEQ Action Plan;
5. To make the report available by the inter-sessional Science Board meeting in May 2013.

Suggested members of study group

Chairman: A senior scientist on marine radioecology from China and a senior scientist on Marine Radioecology from the eastern North Pacific.

Recommended Chairman

Yusheng Zhang, Third Institute of Oceanography, State Oceanic Administration (SOA).

The Biological Oceanography Committee

The *Biological Oceanography Committee* (BIO) held its meeting from 18:30-19:30 h on October 14 and 14:00-17:45 on October 17, 2012 in Hiroshima, Japan. The Chairman, Dr. Atsushi Tsuda, called the meeting to order and welcomed the participants (*BIO Endnote 1*). The proposed agenda was reviewed and is provided in *BIO Endnote 2*.

AGENDA ITEM 3

Annual review of BIO activities

The BIO Committee has 6 subsidiary groups (S-CCME, S-CC, AP-MBM, WG 26, WG 28, WG 29) to understand the biological aspects of the North Pacific ecosystems. S-CC has finalized a database of physical and biochemical parameters (PACIFICA), which is one of the most valuable accomplishments of this group. AP-MBM renewed its Activity Plan last year, focusing on spatial ecology of marine birds and mammals, and actively working through a Workshop and Topic Session with other groups. WG 26 is its third year and preparing to finalize its Working Group report, and planning to contribute to an international symposium on jellyfish in 2013. WG 28 is in its second year, and its progress is obvious through a Topic Session and Workshop at PICES-2012, and inter-sessional workshops. BIO became a co-parent committee of WG 29 at the inter-sessional Science Board meeting in Busan, Korea, in May 2012. WG 22 on iron and WG 23 on krill have finished their activities in 2010 and 2011, respectively. The final report of WG 22 was submitted to BIO but is now being revised according to the Committee's comments. The final reports of both groups are expected to be published by the inter-sessional Science Board meeting in 2013. The second PICES/ICES/IOC Symposium on "*Climate change effects on the world's oceans*" was held in Yeosu, Korea, in May 15–19, 2012 (BIO member, Dr. Hiroaki Saito was a Co-convenor). The symposium was very successful and a special issue of selected papers will be published from the meeting presentations in the ICES Journal of Marine Science. The BIO Action Plan was discussed at the Committee meeting at PICES-2012 and will be finalized by the next inter-sessional Science Board meeting.

AGENDA ITEM 4

Oral and Poster awards

The procedure to select the Awards at PICES-2012 was confirmed as follows: Each BIO member was to list two top candidates for oral presentation by an early career scientist in BIO-sponsored workshops W1, W2, W3, W5 and the BIO Paper Session and provide the names to the BIO Chairman. For Poster presentations, each Committee member was to list two top candidates and provide the names to the BIO Chairman by email. Rankings were compiled by the Chairman and presented to the Secretariat for certificate preparation at the Closing Session. Best Oral presentation was awarded to early career scientist, Tabitha C.Y. Hui of Hokkaido University, for her presentation on "*Spatial, temporal and dietary overlap between harbour seals and fisheries in Erimo, Japan: Conflict at sea?*" and Best Poster was awarded to Chiyuki Sassa of the Seikai National Fisheries Research Institute, for his presentation on "*Seasonal occurrence of mesopelagic fish larvae in the onshore side of the Kuroshio off southern Japan*". (For further details on Award recipients, see the end of the Session Summaries section of the 2012 PICES Annual Report.)

AGENDA ITEM 5

Reports from FUTURE Advisory Panels

Reports synthesizing activities of AICE, COVE, and SOFE were summarized by Dr. Saito. Topics reported included: a) the FUTURE roadmap (see the FUTURE Advisory Panel reports) was summarized and discussed. b) A summary of activities since last year was given. c) Communications between Committees and FUTURE

BIO-2012

still require some improvement. d) Planning for the FUTURE Ocean Science Meeting was described. BIO members should propose topic sessions or workshops, and possible speakers for the FUTURE OSM before the inter-sessional Science Board meeting in spring 2013. BIO endorses this concept and any ideas should be presented as soon as possible. e) The development of NPESR III was briefly described (see the report of AP-SOFE for details); f) Some ways to encourage early career scientists were presented; BIO representatives on FUTURE APs are: Hiroaki Saito for COVE and Sun Song for AICE. Dr. William Peterson was nominated as a SOFE member from the BIO Committee because there was no BIO representation. For FUTURE AP meetings, it was decided that if a BIO member cannot attend, someone else from BIO should attend as a replacement. It is important for the APs to report back to Committee, to maintain good communication.

AGENDA ITEM 6

Reports from subsidiary bodies

Full reports of BIO's subsidiary bodies can be found elsewhere in the [2012 Annual Report](#). Brief highlights are given below.

Section on Climate Change Effects on Marine Ecosystems (S-CCME)

S-CCME Co-Chairman, Dr. Suam Kim, gave a brief oral report on the S-CCME program, which is a 9-year program spread over three 3-year cycles.

Advisory Panel on Marine Birds and Mammals (AP-MBM)

A report summarizing the meeting of AP-MBM, held October 13, 2012, was presented by Dr. Yutaka Watanuki. This detailed presentation included a description of the revised Terms of Reference, the proposed 3-year Activity Plan, and a summary of the AP-MBM Topic Session (S6) on environmental contaminants in marine ecosystems and Workshop (W3) on prey consumption by marine birds and mammals.

Recommendation: BIO approves of the IWC accepting a PICES observer. (This recommendation will be brought forward to the Science Board for approval.)

Section on Carbon and Climate (S-CC)

A summary of activities of this Section was given by Section Co-Chairman, Dr. James Christian. The extensive data set (PACIFICA) they have been working up (approximately 350 cruises over the past 20 years) is now available. This is a great accomplishment and the participants of this Section are to be commended.

Working Group on Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim (WG 23)

WG 23, chaired by Drs. William Peterson (USA) and Song Sun (China) had a term from 2007–2011. The status of the final WG report was briefly explained by Dr. Peterson and it will be published in spring 2013.

Working Group on Jellyfish Blooms around the North Pacific Rim: Causes and Consequences (WG 26)

WG 26, chaired by Drs. Shin-ichi Uye and Richard Brodeur, has a 3-year term from 2010–2013. A summary of the WG 26 meeting, held on October 14, 2012 and their Topic Session (S7, “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*”) on October 18, 2012, was presented by Dr. Brodeur. There were 12 members from all PICES countries present at this meeting, which was primarily an overview of research projects in each country and discussion on the final report. They proposed to convene an inter-sessional workshop in association with the 4th International Jellyfish Bloom symposium in Hiroshima in June 2013. They also requested PICES endorsement for the symposium.

Recommendation: BIO recommends PICES co-sponsorship of the 4th International Jellyfish Bloom symposium.

Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28)

WG 28, chaired by Drs. Motomitsu Takahashi and Ian Perry, has a term from mid-2011–2014. Their main advancement was the development and application of a web-based questionnaire regarding expert opinions on habitats, such as spatial extent, frequency, trophic impact, resistance to change and recovery time, which may be vulnerable to multiple stressors. The results of the survey of experts to identify habitats, stressors, and the vulnerability of habitats to each stressor was discussed for each country and location. Reports of their business meeting, and their Workshop (W1, “*Identifying critical multiple stressors of North Pacific marine ecosystems and indicators to assess their impacts*”) and Topic Session (S10, “*Ecosystem responses to multiple stressor in the North Pacific*”) at PICES-2012 were presented by Dr. Takahashi.

Marine Ecosystem Inter-comparison Project (MEMIP)

An oral report summarizing the MEMIP meetings and workshop (W5 titled “*Comparison of multiple ecosystem models in several North Pacific shelf ecosystems (MEMIP-IV)*”) held on October 12–13, was given by Dr. Harold (Hal) Batchelder. The presentation was followed by discussion about how the goals of the model intercomparison had changed and noted that the group had made very little progress in the past year. He stated that the MEMIP project will not be requesting any financial support from PICES this year and the members will attempt to make good progress before PICES-2013. If successful, they would then request a final session at PICES-2014. BIO commented positively about the progress of MEMIP and fully endorsed its plan for the next year. (*BIO Endnote 3*).

AGENDA ITEM 7

International relationships

International Whaling Commission (IWC)

Dr. Hidehiro Kato, PICES observer to the IWC, reported on the 2012 IWC meeting and its response to a PICES request made last year (*See AP-MBM Endnote 3*). PICES made a request to conduct a sea-bird sighting survey on the IWC/POWER (Pacific Ocean Whale and Ecosystem Research) cruise, but it was not accepted by IWC for logistical reasons. BIO decided to repeat the request.

BEST-BSIERP/NPRB (Bering Sea Project)

Dr. Francis Weise gave a short oral report describing the activities of the North Pacific Research Board (NPRB) emphasizing especially the NPRB programs of relevance to PICES. Projects funded under their annual RFP and their large-scale ecosystem studies were briefly described. Some potential areas for collaboration with PICES were mentioned (*e.g.*, modelling, pollock migrations and habitat use). It was noted that anyone can apply for NPRB funds as long as the work is done in the NPRB study regions and relevant to the NPRB goals, and that PICES scientists are welcome to suggest topics for NPRB study.

Ecosystem Studies of Sub-Arctic Seas (ESSAS)

Dr. Franz Mueter briefly introduced ESSAS, an IMBER regional program. ESSAS is now chaired by Drs. Kenneth Drinkwater and Mueter. The ESSAS OSM meeting in Seattle, USA, in May 22–26, 2011, was described briefly and 2012 activities were listed. Mostly they have been focusing on Arctic-Subarctic interactions. The activities include a workshop (W4, “*Subarctic–Arctic interactions*”) held during PICES-2012.

Action: BIO requests support from PICES for a PICES scientist to attend the ESSAS ASM in January 2013 in Hakodate, Japan, on “*Spatial dynamics of lower trophic levels*”.

Surface Ocean and Lower Atmospheric Studies (SOLAS)

A short oral report was presented by Dr. Yukihiro Nojiri who discussed the SOLAS summer school that is planned for Fall 2013 in Xiamen, China. Partial support for 3 students was requested, as for the previous SOLAS

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summer school in Cargèse, France in 2011. BIO recognized the importance of the SOLAS summer school, especially if held in a PICES member country.

ICES

The Committee members discussed the proposed theme sessions for the ICES ASC in 2013. No strong connections to BIO were apparent. None of these have been jointly developed with BIO members.

AGENDA ITEM 8

Topic sessions and Workshops completed at PICES-2012

Summaries of each BIO-sponsored Topic Session and Workshop convened at PICES-2012 can be found in the Session Summaries Section of the [2012 PICES Annual Report](#).

- S6 “*Environmental contaminants in marine ecosystems: Seabirds and marine mammals as sentinels of ecosystem health*” (BIO/MEQ), Co-convenors: Peter Ross (Canada), Hideshige Takada (Japan) and Yutaka Watanuki (Japan).
 - S7 “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*” (BIO/FIS), Co-convenors: Richard Brodeur (PICES/USA), Cornelia Jaspers (ICES/Denmark), Christopher Lynam (ICES/UK), Song Sun (PICES/China), Shin-Ichi Uye (PICES/Japan) and Won-Duk Yoon (PICES/Korea).
 - S10 “*Ecosystem responses to multiple stressors in the North Pacific*” (BIO/MEQ/FUTURE), Co-convenors: Vladimir Kulik (Russia), Ian Perry (Canada) and Motomitsu Takahashi (Japan). See WG28 Addendum 5.
 - S12 “*Advances in understanding the North Pacific Subtropical Frontal Zone Ecosystem*” (BIO/FIS/POC), Co-Convenors: Taro Ichii (Japan), Skip McKinnell (PICES) and Michael Seki (USA).
- BIO Paper Session Co-convenors: Michael Dagg (USA), Hiroaki Saito (Japan) and Atsushi Tsuda (Japan).

- W1 “*Identifying critical multiple stressors of North Pacific marine ecosystems and indicators to assess their impacts*”. Co-convenors: Jennifer Boldt (Canada), Vladimir Kulik (Russia), Chaolun Li (China), Jameal Samhouri (USA), Motomitsu Takahashi (Japan) and Chang-Ik Zhang (Korea).
- W2 “*Secondary production: Measurement methodology and its application on natural zooplankton community*”. Co-convenors: Toru Kobari (Japan) and William Peterson (USA).
- W3 “*The feasibility of updating prey consumption by marine birds, marine mammals, and large predatory fish in PICES regions*”. Co-convenors: George Hunt, Jr. (USA), Hidehiro Kato (Japan) and Michael Seki (USA).
- W5 “*Comparison of multiple ecosystem models in several North Pacific shelf ecosystems (MEMIP-IV)*”. Co-convenors: Harold Batchelder (USA), Shin-Ichi Ito (Japan), Angelica Pena (Canada) and Yvette Spitz (USA).

AGENDA ITEM 9

Proposed Workshop and Topic Sessions at PICES-2013 in Nanaimo

Proposals for Topic Sessions and Workshops at PICES-2013, and inter-sessional workshops were summarized. Topic sessions had been ranked by BIO Committee members but there were some proposed additions/modifications to the workshop list. BIO endorsed the final summary.

This year, a new system for proposals of Topic Sessions and Workshops was employed, but BIO felt there were some difficulties remaining. BIO consensus is that the new procedure is a good one and some time may be needed for the community to adjust to the new schedule. All members were asked to review the rankings of sessions and workshops for next year’s meeting.

BIO preferred Topic Sessions in ranked order:

1. “*Ecosystem indicators to characterize responses to multiple stressors in North Pacific marine ecosystems*”. (WG 28 Endnote 5),

2. *“Recent trends and future projections of North Pacific climate and ecosystems” (WG 29 Endnote 5).*
3. *“Marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being” (S-HD Endnote 3).*
4. *“Are marine ecosystems of the North Pacific becoming more variable?” (AP-MBM Endnote 6).*

BIO recommended workshops

1. *“Marine bird and mammal spatial ecology” (AP-MBM Endnote 7).*
2. *“Identifying mechanisms linking physical climate and ecosystem change: observed indices, hypothesized processes, and “data dreams” for the future” (WG 27 Endnote 3).*

AGENDA ITEM 10

Additional financial requests

None

AGENDA ITEM 11

Revision of BIO Action Plan

The BIO Action Plan has not been revised since 2007 and a new PICES Strategic Plan was presented after the establishment of the FUTURE program. The BIO Committee discussed an outline of the Action Plan. A new BIO Action Plan will be circulated from BIO Chair to the members and finalized by the next inter-sessional Science Board meeting.

AGENDA ITEM 13

Other items

None

AGENDA ITEM 14

Adjourn

The meeting was adjourned at 17:45 hr.

BIO Endnote 1

BIO participation list

Members

Michael Dagg (USA, Vice-Chairman)
 Se-Jong Ju (Korea)
 Hyung-Ku Kang (Korea)
 Alexei Orlov (Russia)
 Angelica Peña (Canada)
 William Peterson (USA)
 Vladimir Radchenko (Russia)
 Hiroaki Saito (Japan)
 Michael Seki (USA)
 Atsushi Tsuda (Japan., Chairman)
 Mingyuan Zhu (China)

Observers

Harold Batchelder (USA)
 Richard Brodeur (USA)
 James Christian (Canada)
 Hidehiro Kato (IWC)
 Suam Kim (Korea)
 Toru Kobari (Japan)
 Franz Mueter (ESSAS)
 Yukihiko Nojiri (SOLAS)
 Motomitsu Takahashi (Japan)
 Shin-ichi Uye, (Japan)
 Yutaka Watanuki (Japan)
 Francis Wiese (NPRB)
 Sinjae Yoo (Science Board)

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BIO Endnote 2

BIO meeting agenda

1. Welcome, introductions
2. Meeting agenda
3. Annual review of BIO activities
4. Oral and Poster awards
5. Report from FUTURE APs
6. Reports from subsidiary bodies
7. International relationships
8. Topic sessions and workshops (completed) at PICES-2012, and inter-sessional meeting
9. Proposed workshop and Topic Sessions for the 2013 PICES Annual Meeting in Nanaimo, Canada
10. Additional financial requests
11. Revision of BIO Action Plan
12. Other items
13. Adjourn

BIO Endnote 3

Report of Marine Ecosystem Model Intercomparison Project (MEMIP)

Project goal

Our goal remains to conduct a comparison of different marine ecosystem models embedded within well defined physical frameworks at three coastal (shelf-to-slope transects) sites in the North Pacific. Progress was once again delayed due to instabilities in the physical simulations produced by 2D versions of the Regional Ocean Modeling System (ROMS) when they were run with more realistic (but still smoothed) cross-shelf bathymetry.

For the period October 2011 to October 2012, the MEMIP had one workshop in March (no funding requested or received from PICES) in Corvallis, OR, (see Appendix 1) and an abbreviated workshop (W5) at PICES-2012 (see Sessions Summaries section in the [2012 Annual Report](#)). Results of the latter are reported in Session Summaries section of the 2012 PICES Annual Report.

Issues raised with Science Board at ISB-2012 (Busan, Korea)

1. Progress has been slow, but incremental progress on establishing physical test-beds for three years at both Newport and GAK lines in the NE Pacific is occurring.
2. Most of the ecosystem models are already coded into the form required for “plug-n-play” in the ROMS modeling framework (NemuroK5 being the exception). Establishing ecosystem boundary conditions and initial conditions will require some time. Some of this can be done from data in hand (nutrients, chlorophyll, PON, maybe zooplankton biomass) for the Newport and GAK test-beds, but it will require some time and effort. Some state variables in some models (*e.g.*, small phytoplankton *vs.* large phytoplankton; microzooplankton biomass) were not measured routinely in either ecosystem, so boundary conditions for those, especially in limited domain 3D models may be troublesome.
3. We still have hopes for successful runs in two North Pacific coastal systems before PICES-2012—but the schedule is very tight.

Proposed schedule of activities through to completion in 2014

During 2013–2014, members of the MEMIP will use 3D physical models for the three core cross-shelf transects [Newport Line in the California Current, Seward (GAK) Line in the Gulf of Alaska, and A-Line off of Hokkaido Island] as the framework for comparing various several different pelagic ecosystem models. The models are operational and tuning of the ecosystem models will be completed. The necessary comparison simulations will be run by the end of 2013, and in 2014, the MEMIP will complete the model-model ecosystem comparisons, and the model-data comparisons. In 2013, the MEMIP team will submit a proposal for a topic session to be held at PICES-2014 to showcase the results of the comparisons.

Appendix 1

Report of March 2012 MEMIP Workshop (Corvallis, OR, USA)

From March 26–30, 2012, a subset of the MEMIP investigators (Hal Batchelder, Yvette Spitz, Angelica Peña, and Jerome Fiechter) met in Corvallis, OR (USA) to make progress on several of the key steps needed to complete the model intercomparison and model-data comparisons that were promised by the group. Overall, we made some progress on establishing a physical test bed for the Newport, OR line (in the California Current seasonal upwelling region) and the GAK line that extends southeastward from Seward, Alaska. These represent two of three physical test-beds that are the focus of the MEMIP activities. The third site is the A-Line that extends southeastward to 38°N from the town of Akkeshi on the coast of Hokkaido, Japan.

After much discussion, it was decided to use a limited domain 3D model for the GAK region. The advantage of the 3D model over the originally intended 2D model is that the 3D model directly benefits from a larger scale regional ROMS physical model that assimilates physical data to better represent the substantial shelf-edge mesoscale variability (eddies) observed in the “real” ocean. The downside of the 3D model is that the resolution is relatively coarse (10 km horizontal resolution) for representing the real ocean physical variability in the inner shelf region, and for the inner shelf region the bathymetry is greatly smoothed and not particularly representative of the actual bathymetry on the GAK line (for instance, the greater depths of GAK1 [the innermost shelf station] is not represented at all in the model). Dr. Spitz is continuing to explore an alternative 2D model test-bed of the GAK line that has better horizontal resolution, 1–2 km, and closer to reality bathymetry (including GAK1). But as yet, the 2D model cannot adequately represent the inner shelf hydrographic structure due to difficulties with freshwater from the Alaska Coastal Current. It was unclear at the time of this writing whether an adequate 2D model of the GAK line will be available in time for us to proceed with our ecosystem model comparisons.

The Newport 2D model has some spurious shelf edge signals (variability) which may be real or not. These seem to be due to the sharp change in the bathymetry at the shelf-edge and slope. Dr. Spitz continues to work on resolving this. If it turns out that they are spurious due to the model formulation, we may resort to a small domain 3D model for the Newport line as well.

Because Dr. Shin-ichi Ito was unable to attend the March workshop, we do not know the status of bringing an A-Line physical test-bed to fruition. It would be nice to have a third test-bed, but for a successful MEMIP activity, we MUST have two test-beds. The hope is to have the Newport and GAK lines operational by late June 2012.

Additionally, participants in the MEMIP discussed how to summarize the ecosystem data that are available for these two transects. The Newport Line was sampled extensively in 2000, 2001 and 2002 (most extensive in the even years). In the same years, the GAK line was well sampled (2001 is the best year). Recall that a goal of the MEMIP is to assess the ability of the model to represent the cross-shelf and temporal variation of nutrients, phytoplankton (chlorophyll) and zooplankton (concurrently). Observations included nutrients (ammonia, nitrate and silicate), total phytoplankton chlorophyll (rarely size-fractionated), and mesozooplankton biomass estimation using nets of various types and mesh sizes. Nutrients and extracted chlorophyll estimates are from CTD-rosette casts, and extend to 80–100 m in most cases, depth permitting.

The Newport Line was occupied about 5 times per year to *ca.* 65–85 nautical miles (nm) offshore, with additional sampling for mesozooplankton, CTD casts, and surface chlorophyll and nutrients within 20 nm occurring more frequently. The most comprehensive mesozooplankton data were obtained from vertically towed 0.5 m diameter plankton nets of 202 μ m mesh. Depth integrated tows were from 100 m to the surface, except where the bottom was shallower than 100 m, so tows there were from 5 m above the bottom to the surface. Abundances and biomasses of each copepod prey category were estimated. Other prey types were counted and sized, but (in some cases) have not been converted to biomass estimates. According to Dr. Bill Peterson, the originator of these data, the copepod biomass comprises “more than 90%” of the total zooplankton biomass in all samples except a few offshore stations where swarms of euphausiids were captured.

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The GAK line was sampled *ca.* 7 times per year with a sampling regime for nutrients and chlorophyll that was similar to that at the Newport Line. Mesozooplankton were sampled with a CalVET net instead of a 0.5 m ring net. The CalVET net (25.4 cm diameter; 149 μ m mesh) was towed vertically from 100 m to the surface, depth permitting. Abundance and wet weight biomass (estimated) was reported for each taxa captured in a tow.

Dr. Batchelder agreed to summarize the observational data to make them useful for the modelers to compare with the model outputs. A schedule of future MEMIP activities up to PICES-2012 was developed (below).

Proposed schedule (April–October, 2012)

April 6: Hal Batchelder to distribute schedule and work plan to MEMIP investigators.

May 31: Jerome Fiechter will provide the files needed to run the limited 3D domain ROMS model that includes the GAK line; this includes the surface forcing files, the FW forcing, the boundary conditions, and the initial physical conditions. On or before this date all of the files needed to run the physical test bed for GAK will be uploaded to orion.afsc.noaa.gov [ORION]. We anticipate that coupling of specific ecosystem models with the physical test-beds will be done on our own local computers. FINAL simulations for comparisons across different ecosystem models and different test-beds will all be run on “orion”, to eliminate hardware and compiler dependent differences on the output.

June 30: before or on this date Yvette Spitz will upload the production version of the Newport physical model to ORION. This may be 2D or 3D, whichever does a better job of replicating the physics.

July 7: START ORION SIMULATIONS. Because there are only 8 cpus on ORION (orion.afsc.noaa.gov), we have established the following schedule for specific models/participants to do their simulations. Ideally, each different ecosystem model will be “tuned” to produce a reasonably good comparison to observations for at least one of the three model test-beds. We allocate 1 week (7 days) to each model. This is based on preliminary timings we have done (and best guesses) on how long the simulations will take. There will be a minimum of 6 simulations per model. For example, for a generic NEMURO ecosystem model there will be 3 years X 2 test-beds (= 6 simulations) done. We suggest that Yvette (1 model) and Jerome (2 models) go first, as they will be most familiar with the physical test-beds, and those three weeks will be useful to the other members in allowing them to experiment (tune) their individual ecosystem models using their local computational resources (prior to FINAL runs being done on ORION).

July 8: Yvette Spitz

July 15: Jerome Fiechter (model 1)

July 22: Jerome Fiechter (model 2)

July 29: Angelica Peña

August 5: Guimei Liu

August 12: Hal Batchelder

August 19: Shin-ichi Ito

September 1: (A) Last date for ALL ecosystem data to be compiled and appropriately aggregated and shared via either email or ORION. These will be the “observations” to which the model outputs are compared. Getting the data observations on orion will be done by Hal Batchelder, and probably much earlier than this date, because they will be useful for tuning models during the July–August timeframe. (B) ALL model simulations (7 models X 3 years X 2 sites = 35 simulations) will be available on ORION. Permissions on model simulation outputs will be set so that all MEMIP members can retrieve model results (if they choose to do so).

September 2–October 1: Individual MEMIPers evaluate their model (*e.g.*, Guimei = CoSINE; Batchelder = NEMUROK5, *etc.*) to available data sets as summarized for the 1 September deadline (see above) for all 3 years at both sites.

October 12–13: MEMIP WORKSHOP just before PICES-2012 in Hiroshima, Japan.

The Fishery Science Committee

The meetings of the Fishery Science Committee (FIS) was held from 18:00–19:30 on October 14 and 14:00–18:00 h on October 17, 2012. Chair, Dr. Elizabeth (Libby) Logerwell, called the meeting to order and welcomed participants. She welcomed new member, Dr. Anya Dunham who is replacing Dr. Laura Richards and representing Canada. The meeting was attended by 9 FIS members plus 11 observers (*FIS Endnote 1*). The agenda was adopted without modification (*FIS Endnote 2*). Dr. John Field served as rapporteur.

AGENDA ITEM 3

2012 FIS Best Oral presentation and Poster awards

Volunteers were sought to form judging committees for the FIS Committee awards to be given during PICES 2012. Drs. Mikhail Stepanenko, Gordon Kruse and Libby Logerwell agreed to serve as the awards committee for FIS Best Oral Presentation by a young scientist. The FIS Best Oral Presentation Award was given to Xun Zhang for a presentation on “*Spatial modeling of the potential fishing zone of Japanese common squid in coastal waters of southwestern Hokkaido, Japan*” during the FIS Paper Session. Yasuzumi Fujimori and Toyomitsu Horii agreed to serve as the awards committee for FIS Best Poster. The FIS Best Poster Award was given to Atsushi Tawa for a poster on “*High dispersal of moray eel larvae to the open ocean: Early life history estimated from oceanwide distribution patterns*” during the FIS Paper Session. This year’s selections were chosen from topic sessions S7, S8, and the FIS Paper session.

AGENDA ITEM 4

FIS Chairman’s report: Implementation of PICES-2011 decisions

PICES-2012 Topic Sessions

At PICES-2012, FIS sponsored the following Topic Sessions:

- S1 Science Board Symposium on “*Effects of natural and anthropogenic stressors in the North Pacific ecosystems: Scientific challenges and possible solution*” (Oct. 15, ¾ day). Co-convenors: Sinjae Yoo (SB), Atsushi Tsuda (BIO), Elizabeth Logerwell (FIS), Hiroya Sugisaki (MONITOR), Kyung-Il Chang (POC), Toru Suzuki (TCODE), Thomas Therriault (AICE), Hiroaki Saito (COVE), Robin Brown (SOFE), Igor Shevchenko (Russia), Fangli Qiao (China);
- S4: FIS/MONITOR/POC. *Monitoring on a small budget: Cooperative research and the use of commercial and recreational vessels as sampling platforms for biological and oceanographic monitoring* (Oct. 17, ½ day). Co-Convenors: Steven Barbeaux (USA), Jennifer Boldt (Canada), Martin Dorn (USA) and Jae Bong Lee (Korea);
- S7: BIO/FIS. *Jellyfish in marine ecosystems and their interactions with fish and fisheries* (Oct. 18, 1 day). Co-Sponsored by ICES, Co-Convenors: Richard Brodeur (PICES/USA), Cornelia Jaspers (ICES/Denmark), Christopher Lynam (ICES/UK), Song Sun (PICES/China), Shin-Ichi Uye (PICES/Japan) and Won-Duk Yoon (PICES/Korea);
- S8: POC/FIS. *Linking migratory fish behavior to End-to-End models II* (Oct. 17, ½ day). Co-Convenors: Enrique Curchitser (USA), Shin-ichi Ito (Japan) and Michio Kishi (Japan);
- S9: FIS/MEQ. *Ecological functions and services associated with marine macrophyte communities as indicators of natural and anthropogenic stressors in nearshore zones of the North Pacific* (Oct. 19, ½ day). Co-Convenors: Ik-Kyo Chung (Korea) and Jun Shoji (Japan);
- S12: BIO/FIS/POC. *Advances in understanding the North Pacific Subtropical Frontal Zone ecosystem* (Oct. 19, ½ day). Co-Convenors: Taro Ichii (Japan), Skip McKinnell (PICES) and Michael Seki (USA);
- FIS Paper Session (Oct. 18, 1 day). Co-Convenors: Xianshi Jin (China) and Elizabeth Logerwell (USA)

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Summaries of these sessions and Symposium can be found in the *Session Summaries* section of the [2012 Annual Report](#).

International symposia

The following international symposia in late 2011 and 2012 were supported by FIS or of interest to FIS members:

- NPAFC International Workshop on “*Explanations for the high abundance of pink and chum salmon: Future trends*”, Nanaimo, British Columbia, Canada, October 30–31, 2011 (co-sponsored by PICES);
- PICES/FRA/NOWPAP/WESTPAC Workshop on “*Introduction to Rapid Assessment Survey methodologies for detecting non-indigenous marine species*”, Seikai National Fisheries Research Institute, Nagasaki, Japan, February 8–9, 2012 (co-convened by Thomas Therriault (Canada));
- CLimate Impacts on Oceanic TOp Predators (CLIOTOP) special session on “*Global science for global governance of oceanic ecosystems and fisheries*” co-sponsored by PICES at the Planet Under Pressure Conference (March 26–29, 2012, London, UK);
- 2nd ICES/PICES Early Career Scientist Conference on “*Oceans of change*” Majorca Island, Spain, April 24-27, 2012 (co-convened by Skip McKinnell (PICES));
- PICES/ICES/IOC Second International Symposium on the “*Effects of climate change on the world’s oceans*”, Yeosu, Korea, May 15–19, 2012 (co-convened by Suam Kim (Korea));
- IMBER ClimECO3 Summer School on “*A view towards integrated earth system models. Human-nature interactions in the marine world*”, Ankara, Turkey, July 23–28, 2012 (co-sponsored by PICES);
- GLOBEC/PICES/ICES International Workshop on “*Forecasting ecosystem indicators with climate-driven process models*”, Friday Harbor Labs, Washington, USA, September 8–10, 2012. (Jacquelyne King (Canada) was an organizer). Workshop report is available online at <http://wg27.pices.int/ecofor/>.
- 2012 ICES Annual Science Conference, September 17-21, Bergen, Norway. Joint theme sessions:
 - Session A on “*Understanding, measuring and projecting the limits of resilience in marine ecosystems*”;
 - Session I on “*Multidisciplinary perspectives in the use (and misuse) of science and scientific advice in Marine Spatial Planning*”;
 - Session M on “*Subarctic-Arctic interactions: Ecological consequences*”;
 - Session Q on “*Sustainability of aquaculture*”.

Publications

The following progress was made on FIS-related PICES publications:

- Special issue on “*Ecosystem-based approaches for the assessment of fisheries under data-limited situations*”, *Fisheries Research* 112, December 2011. Product of PICES-2009 Topic Session S2. Guest editors: Patricia Livingston (USA), Gordon Kruse (USA), and Laura Richards (Canada).
- Special issue on “*Economic relations between marine aquaculture and wild capture fisheries*”, *Aquaculture Economics and Management* 16 (2), 2012. Product of PICES-2010 FIS/MEQ Topic Session (S7). Guest Editors: Minling Pan (USA) and PingSun Leung (USA).
- Special issue on “*Comparative studies on climate effects on polar and subpolar ocean ecosystems: Progress in observations and predictions*”, *ICES Journal of Marine Science* 69 (7), 2012. Product of the second ESSAS (Ecosystem Studies of Sub-Arctic Seas) Symposium, May 22–26, 2011, Seattle, USA. Co-sponsored by PICES.
- Special issue based on selected papers from the 2011 ESSAS Open Science Meeting session on “*Modeling marine ecosystem dynamics in high latitude regions*”, *Progress in Oceanography*. Guest Editors: E. Curchitser, Geir Huse and S.I. Ito
- Proceedings of the 26th Wakefield Symposium on “*Global progress on ecosystem based fisheries management*”, November 8–11, 2010, Anchorage, USA, University of Alaska Sea Grant, 2012. Co-sponsored by PICES. Editors include: Gordon Kruse (USA), Patricia Livingston (USA) and Chang-Ik Zhang (Korea)
- PICES Advisory Report to the Cohen Commission on “*The decline of Fraser River sockeye salmon in relation to marine ecology*”. Reproduced from web-based Cohen Commission Tech. Rep. No. 4. Lead author: Skip McKinnell, PICES Scientific Report 41, 2012.

- McKinnell, S.M. and Reichardt, M.R. 2012. Early marine growth of juvenile Fraser River sockeye salmon (*Oncorhynchus nerka*) in relation to juvenile pink (*Oncorhynchus gorbusha*) and sockeye salmon abundance. *Canadian Journal of Fisheries and Aquatic Sciences* 69: doi:10.1139/F2012-078.

AGENDA ITEM 5

Update on FUTURE activities and review of FUTURE meeting

Dr. Logerwell presented an update on FUTURE activities and review of the FUTURE meeting. FUTURE activities since PICES-2011 included an inter-sessional Science Board workshop which focused on the development of the FUTURE roadmap (May 24–25, 2012, Busan, Korea). In addition, all 12 Topic Sessions, and about half of the 8 Workshops, at PICES-2012 were FUTURE-related. New expert groups formed since last year include: Section on *Human Dimensions of Marine Systems*, Section on *Climate Change Effects on Marine Ecosystems* (jointly with ICES), and WG 29 on *Regional Climate Modeling*. In addition, a Section on Marine Pollution was proposed at PICES-2012. Regarding FUTURE APs, there is concern that some countries and Committees are weakly represented (this is a particular problem for AICE). FUTURE needs to work better with Committees to make sure they are properly represented. The next steps for FUTURE include reviewing the FUTURE roadmap, deciding on products from the expert groups and planning for the FUTURE Open Science Meeting. One proposed product is an annual North Pacific Ecosystem Status Report to be published on the internet. Inter-sessional FUTURE meetings or workshops for 2013 include the inter-sessional Science Board/FUTURE meeting to be held in St. Petersburg, Russia. S-CCME has proposed a workshop on range shifts and climate change (in collaboration with ICES) for this meeting. In addition, a Harmful Algal Bloom workshop has been proposed (in collaboration with NOAA, SCOR, IOC and GEOHAB). The FIS Committee discussed FUTURE products and outreach ideas. Members acknowledged that help is needed in coming up with ideas because the format may not be typical of most scientific activities. Some ideas brought up were to post newswire items on websites; and to make local connections in each PICES member country, for instance with educators, fishers or community groups in the city hosting the PICES Annual Meeting. FIS also discussed the FUTURE Roadmap as provided by Science Board Chairman, Dr. Sinjae Yoo. It is time to think ahead to new working groups that might follow up on the results of current FUTURE WGs 27, 28 and 29, such as a Working Group on Ecosystem Resilience. Regarding planning for the FUTURE Open Science Meeting, FIS members agreed that using the Implementation Plan to structure the meeting was a good start and are willing to provide more specific feedback as plans develop. Finally, FIS discussed the proposal by Dr. Phillip Mundy (AP-SOFE) to publish a web-based annual update to the North Pacific Ecosystem Status Report. Members recommended that indices and indicators be able to be linked to fisheries production. Automation of submission of indices and formatting of the report is an appealing feature of the plan. Overall, FIS supports the idea.

AGENDA ITEM 6

Status reports of FIS-sanctioned groupsa. PICES/ICES Section on *Climate Change Effects of Marine Ecosystems* (S-CCME)

S-CCME Co-Chair, Dr. Anne Hollowed, provided a summary of S-CCME activities.

- ICES WKOOI meeting February 29–March 2, Copenhagen, Denmark. S-CCME member Jon Hare co-chaired a workshop to define the Ocean Observing Needs for ICES (WKOOI).
- ICES WGIPEM meeting March 13–16, Copenhagen, Denmark. S-CCME member Myron Peck also serves as the chair of the Working Group on Integrative Physical-Biological and Ecosystem Modeling (WGIPEM).
- 6th World Fisheries Congress on “*Sustainable fisheries: Climate impacts*”, May 2012, Edinburgh, Scotland. S-CCME. Co-Chairs Manuel Barange and Brian MacKenzie were co-convenors of this session.
- S-CCME meeting, Yeosu, Korea, 2012.

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- PICES/ICES/IOC 2nd Symposium on “*Effects of climate change on the world’s oceans*”, Yeosu, Korea (May 13–20, 2012). Dr. Suam Kim (S-CCME Co-Chair) served on the symposium scientific steering committee. Dr. Hollowed (S-CCME Co-Chair), Miguel Bernal (Spain, ICES WGIPEM) and Keith Criddle (University of Alaska Fairbanks, PICES Section on *Human Dimensions of Marine Systems*) co-convended a theme session (Session 4) titled: “*Climate change effects living marine resources: From physics to fish, marine mammals, and seabirds, to fishermen and fishery dependent communities*”. This was the largest session of the symposium, with 55 oral presentations from scientists from 17 countries. S-CCME Co-Chair, Dr. Manuel Barange (United Kingdom), was the keynote plenary speaker; his talk was titled: “*Quantifying the impacts of climate change on marine shelf ecosystems and their resources: Feeding the world in 2050*”. Dr. Shin-ichi Ito (Japan) was the theme session invited speaker, giving a presentation titled: “*Climate induced fluctuation of Japanese sardine, its influence on marine ecosystem and human being*”.
- PICES FUTURE Workshop May 22–24, 2012, Busan, Korea. S-CCME Co-Chairs, Drs. Hollowed and Kim, attended the workshop.
- PICES/ICES/GLOBEC Workshop on “*Forecasting ecosystem indicators with climate-driven process models*” held on September 8–10, 2012, Friday Harbor Labs, WA, USA. Dr. Hollowed attended as a S-CCME representative.
- S-CCME meeting, ICES ASC, Bergen, Norway 2012.
- ICES ASC 2012 – Theme Session M. S-CCME members, Drs. Ken Drinkwater (ICES) and Hollowed (PICES) along with two other scientists co-convended an ICES/ESSAS/PICES/AOSB Theme Session (Session M) “*Subarctic-Arctic interactions: Ecological consequences*” at the ICES ASC. This activity focused attention on the effects of climate change on polar ecosystems.
- PICES Annual Meeting POC Topic Session. S-CCME members Jürgen Alheit (ICES) and Michael Foreman (PICES) along with three other scientists co-convended a PICES/CLIVAR/ICES Topic Session S3 on “*Challenges in understanding Northern Hemisphere ocean climate variability and change*”.
- PICES Annual Meeting ESSAS Workshop. S-CCME members Ken Drinkwater (ICES) and James Overland (PICES) along with two other scientists co-convended an ESSAS Workshop W4 on “*Sub-arctic/Arctic interactions*”.
- Dr. Hollowed described many forthcoming publications from S-CCME activities, including special issues in *Deep Sea Research II* and *Global Environmental Change*.
- Dr. Hollowed also described a S-CCME proposal for the inter-sessional FUTURE workshop. The topic would be “*Climate change and spatial distribution*”. The first goal would be to produce a global atlas, the second would be to examine the utility of current models to predict distributional shifts, the third would be a vulnerability analysis to examine likelihood of fish movements with climate change and finally to examine the likely consequences with respect to management of transboundary stocks. **FIS is strongly supportive of the proposed S-CCME inter-sessional workshop.**

b. Working Group on *Environmental Interactions of Marine Aquaculture* (WG 24)

WG 24 Co-Chair, Dr. Katsuyuki Abo, provided a summary of the activities of the FIS/MEQ Working Group. WG 24 held its final meeting on October 15, 2011, in Khabarovsk, Russia. Although 2010/2011 was to be the last year of the WG, members were not able to complete the Final Report, so an extension was requested and granted until PICES-2012. After the PICES-2011, the activity of WG 24 was low. The WG did not receive a report from USA for TOR-1 (country reports on environmental interactions of aquaculture) or reports from China for all TORs. WG members will discuss the possibility of forming a new Study Group at PICES-2012. WG 24 members feel that aquaculture issue are important for PICES and WG members should assist in the success of proposed Topic Sessions on rehabilitation of depleted wild fishery stocks and ecosystem indicators to characterize ecosystem responses to multiple stressors. WG members intend to propose a Topic Session or Workshop on aquaculture for the PICES-2014.

AGENDA ITEM 7

Relations with other programs and organizations*a. Fisheries and Aquaculture Department, FAO*

Dr. Yimin Ye, Senior Fishery Resources Officer, presented a report on the Fisheries and Aquaculture Department of FAO. He described the structure of the Department, the location of Regional Offices and the staff composition. The role of the department is to collect and distribute statistics, monitor world fish resources and fisheries, provide management advice (upon request), develop research and fisheries management capacity, promote technology transfer, provide policy advice and technical assistance and provide a neutral forum and negotiation platform. FAO has been involved in several activities related to climate change. For instance, FAO co-sponsored the International Symposium on “*Climate change effects on fish and fisheries*” in April 2010 in Sendai, Japan. FAO also co-organized a sub-theme on climate change at the Korean Expo 2012 in Yeosu. Dr. Ye mentioned that FAO will organize a world conference on adaptation and mitigation to climate change in 2013, but no details were provided. FAO is seeking collaboration with PICES on several issues, including: assessment and monitoring of fish resources and fisheries; integration of climate change mitigation and adaptation measures in fisheries management; implementation of an Ecosystem Approach to Fisheries; and development of collaborative information systems in statistics and bibliographic databases. FAO has submitted a proposal to PICES to co-sponsor the World Conference on “*Stock assessment methods*” to be held in Boston, USA, from July 15–19, 2013. **FIS recommends PICES support this conference.** In addition, FIS recommends that the conference include discussion of ecosystem effects that are important capture in stock assessments.

b. North Pacific Research Board

Dr. Francis Wiese, Science Director, North Pacific Research Board (NPRB), gave an overview of the NPRB, its major projects/research initiatives, and ideas for collaboration with PICES. The vision of NPRB is to build a clear understanding of the North Pacific, Bering Sea, and Arctic Ocean ecosystems that enables effective management and sustainable use of marine resources. NPRB-funded research should address pressing fishery management issues or marine ecosystem information needs in the Gulf of Alaska, Bering Sea and Aleutian Islands, and the Arctic Ocean. These goals are to be implemented following the NPRB Science Plan and a competitive, annual Request for Proposals (RFP). In addition NPRB funds a three larger Integrated Ecosystem Research Projects (IERP). The first is being conducted on the Gulf of Alaska shelf (GOAIERP). The goal of this project is to investigate what factors most affect how five target species of groundfish survive from spawning to recruitment. Factors being investigated include currents, temperature, nutrients, prey, predation, competition and habitat. The second large project is the Bering Sea Project (BEST-BSIERP). The goal of this project is to develop whole ecosystem climate change scenarios by collecting new field data and building vertically-integrated coupled ecosystem models from climate to humans. The third large project is the Pacific-Arctic Gateway Ecosystem Study which will focus on energy flow between the Northern Bering Sea and Chukchi Sea through Bering Strait. Dr. Wiese also described a new program on Long-term Monitoring that will be launched in June 2013. This program will support collaborative studies that are multi-disciplinary and applied (*i.e.*, important to subsistence or commercial fishing activities). NPRB is seeking collaboration with PICES scientists on topics such as Bering Sea model comparisons, pollock migration in the Bering Sea, young-of-the-year fish studies in other areas (to compare with the Gulf of Alaska), climate change implications in the Northern Bering and Chukchi Seas. One way to make the interaction between PICES and NPRB more formal would be for PICES to submit a list of research priorities that NPRB could incorporate into its Annual RFP. **FIS is supportive of this suggestion**, particularly as NPRB can fund investigators from outside the USA, as long as the research takes place in Alaskan waters.

c. Ecosystem Studies of Sub-Arctic Seas (ESSAS)

Dr. Franz Mueter gave a presentation on the goals and activities of ESSAS. The goal of ESSAS is to compare, quantify and predict the impact of climate variability and global change on the productivity and sustainability of subarctic marine ecosystems of both the Atlantic and Pacific. The 2011 ESSAS Open Science Meeting (held in Seattle in May) resulted in three special publications: *ICES Journal of Marine Science* (volume dedicated to

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the late Dr. Bern Megrey), *Marine Ecology Progress Series* special section on gadoid-crustacean interactions, and *Deep Sea Research II* special issue on Bering Sea studies. Activities in 2012 included: a poster session on Arctic-subarctic interactions at the Ocean Sciences Meeting in Salt Lake City, USA; an ESSAS/ICES workshop on “*Advection in polar and subpolar regions*” at the Symposium on “*Climate change in the world’s oceans*” in Yeosu, Korea; an ESSAS/PICES/ICES theme session on “*Arctic-subarctic interactions*” at the ICES Annual Science Conference in Bergen, Norway; and an ESSAS/PICES/ICES workshop on “*Arctic-subarctic interactions*” at the PICES Annual Meeting in Hiroshima, Japan. ESSAS will hold its next Annual Science Meeting in Hakodate, Japan, January 7–9, 2013. The overall theme will be spatial dynamics. One day will focus on Japanese research. There will be theme sessions on spatial dynamics, modeling of subarctic ecosystems, Arctic-subarctic interactions, bioenergetics and human dimensions. The latter two sessions may also result in new Working Groups. ESSAS requests that PICES encourage participation of its scientists in ESSAS activities, especially the Annual Science Meeting in Hakodate. ESSAS requests that PICES support financially at least one PICES scientist to attend the ESSAS Annual Science Meeting. **FIS supports this request.** ESSAS is particularly interested in having a bioenergetics expert from PICES participate in the meeting. A second need is experts of the spatial distribution of fishes in the Arctic, in particular at the Arctic/sub-Arctic boundary.

d. International Scientific Committee to study the tuna and tuna-like species of the North Pacific Ocean (ISC)

Dr. Cisco Werner presented an overview of ISC and specific ideas for PICES collaboration. The ISC is an intergovernmental body dedicated to advancing fishery science of North Pacific tuna and tuna-like fishes through cooperation and collaboration among interested parties. The ISC was established in 1995 through an inter-governmental agreement between the governments of Japan and the U.S. Membership is open to coastal states and fishing entities that border the region or that have vessels fishing for tuna and tuna-like species in the region, and to relevant intergovernmental fishery or marine science organizations. The mission of ISC is to enhance scientific research and cooperation for conservation and rational utilization of the species of tuna and tuna-like fisheries which inhabit the North Pacific and to establish the scientific groundwork for the conservation and rational utilization of these species in the region. Results of the ISC from stock assessments are made available to participating members and highly migratory species Regional Fishery Management Organizations of the Pacific Ocean. In addition, the ISC provides scientific support for the work of the Northern Committee of the Western and Central Pacific Fisheries Commission (WCPFC) and scientific collaboration with the Inter-American Tropical Tuna Commission (IATTC). Current members of the ISC are Canada, China, Chinese-Taipei, Japan, Korea, Mexico, and the United States. Recent and future assessments and activities include tuna, marlin and shark assessments and a tuna age and growth workshop (to be held in late 2013-early 2014). ISC also supports research on: the relation between pelagic species and environmental signals, climate change scenarios and end-to-end modeling. Dr. Werner suggested three possible avenues for collaboration between ISC and PICES: 1) Support one PICES scientist for a Special PICES Seminar at ISC13 (Korea, July 2013) focusing on environmental data availability and modeling capabilities and possible techniques for incorporating this information into ISC stock assessments; 2) Support a Topic Session or Workshop at the 2013 PICES Annual Meeting (Oct. 2013, Nanaimo, Canada). The topics could explore the incorporation of oceanographic data and modeled scenarios into analyses for ISC fisheries such as stock assessments, stock structure, and species movement; 3) Participation/*ex-officio* membership of scientists in appropriate committees/WGs, *e.g.*, PICES scientists in ISC Working Groups such as North Pacific Albacore, and/or ISC Scientists in PICES WGs or Task Teams. **FIS supports the idea of sharing membership and participation between PICES and ISC Working Groups. FIS is also in favor of sending a PICES scientist to the ISC13 meeting in Korea.** FIS found the PICES-2013 Topic Session proposal of interest, but did not formally rank the proposal because it was submitted after the deadline. FIS members noted that the Topic Session proposed by ISC could be incorporated into the existing Topic Session proposal by Hollowed et al. on recruitment curves.

e. North Pacific Anadromous Fish Commission (NPAFC)

Dr. Shigehiko Urawa made a presentation on NPAFC activities and potential collaborations with PICES. Dr. Urawa presented an update of the Salmon Status Report for 1995–2011. Recent Pacific salmon abundance is at

high levels (over 1 million tonnes in 2007, 2009 and 2011) although temporal abundance patterns vary among species and regions. For example, pink and chum salmon abundance is high but coho and chinook are less abundant than in the past. The NPAFC Science Plan (2011–2015) details the overarching goals of the commission. They are to: explain and forecast the annual variation in Pacific salmon production; and improve understanding of common mechanisms that regulate Pacific salmon production to increase the accuracy of short-term and long-term forecasting. NPAFC will convene two symposia in the near future. The Third International Workshop on “*Migration and survival mechanisms of juvenile salmon and steelhead in ocean ecosystems*” will be held during April 25–26, 2013, in Honolulu, USA. The International Symposium on “*Forecasting Pacific salmon production*” will take place in Japan in 2015 (exact date and location not determined yet). A proposal has recently been submitted to the Commission to establish an “International Year of the Salmon”. The concept is to construct an initiative to conduct cooperative and focused research to identify definitive mechanisms that regulate Pacific salmon abundance. The first step will be to form a working group to study the feasibility of this initiative. Dr. Urawa presented a proposal for enhanced collaboration and communication between NPAFC and PICES. He proposed that PICES and NPAFC hold a Joint Study Group Session in conjunction with the 2013 PICES Annual Meeting in Nanaimo, Canada to develop a framework and action plan for mutual scientific cooperation. **FIS supports a meeting at PICES-2013 between NPAFC and PICES to prepare joint goals and outline an action plan.**

AGENDA ITEM 8

Status report on FIS topic sessions and workshops for PICES 2013

PICES-2013 Topic Sessions

Prior to PICES-2012, the following Topic Sessions were proposed and prioritized from highest to lowest priority by FIS for PICES-2013:

1. 1-day FIS Contributed Paper Session (top priority, *FIS Endnote 3*),
2. *Banking on recruitment curves; returns on intellectual investment (FIS Endnote 3)*,
3. *Ecosystem indicators to characterize ecosystem responses to multiple stressors in North Pacific marine ecosystems (WG 28 Endnote 5)*,
4. *Marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being (S-HD Endnote 3)*,
5. *Ecosystem considerations in the management of Pacific cod fisheries in the North Pacific Ocean with lessons from Atlantic cod* [not accepted at the Science Board meeting],
6. *Science needs for offshore oil and gas development in the North Pacific (FIS Endnote 3)*,
7. *Rehabilitation of depleted wild fishery stocks and their deteriorated habitat by artificial means - successes and failures, potential and limits* [not accepted at the Science Board meeting],
8. *Aquatic invasive species in the North Pacific: integrating research and management* [not accepted at the Science Board meeting],
9. *Are marine ecosystems of the North Pacific becoming more variable? (AP-MBM Endnote 6)*,
10. *Recent trends and future projections of North Pacific climate and ecosystems (WG 29 Endnote 5)*,
11. *The changing carbon cycle of North Pacific continental shelves and marginal seas (S-CC Endnote 3)*,
12. *Towards the development of low-cost cooperative ocean monitoring networks (MONITOR Endnote3)*,
13. *Impacts of ecosystem assessment on fishery policy and management* [not accepted at the Science Board meeting].

FIS also considered a last-minute proposal for a Topic Session on “*Marine pollutants – status and trends of pollutants for marine ecosystems*”, but the Committee decided the topic was more directly relevant to the interests of MEQ and less so for FIS, so no prioritization was made for this proposal.

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AGENDA ITEM 9

Proposals for new FIS Working Groups and Study Groups

The FIS Committee received no new proposals for working groups.

AGENDA ITEM 10

Proposals for new meetings/conferences with PICES as organizer

Dr. Adi Kellerman Head (ICES Scientific Program) presented five ICES science symposia for 2013–2014 that PICES might have interest in co-sponsoring. They are:

- With NAFO: Symposium on “*Gadoid fisheries: the ecology and management of rebuilding*”. Convenors: Ed Trippel (CAN), Fritz Koester (DK), St. Andrews, Canada, June 2013;
- With FAO: World Conference on “*Stock assessment methods*”. Convenors: Steve Cadrin (USA), Mark Dickey-Collas (DK), Rick Methot (USA), Boston, USA, July 16–18, 2013;
- With FAO: Symposium on “*Making the most of fisheries dependent data: Science, management, and policy-making with the active participation of stakeholders*”, March 2014, at FAO Headquarters, Rome, Italy. Convenors: Norman Graham (IRE) Hendrik Doerner (JRC) William Karp (USA) and Marco Frederiksen (DK);
- Symposium on “*Effects of fishing on benthic fauna and habitat: Change in ecosystem composition and functioning in response to fishing intensity, gear type and discard*”, May 2014, Tromsø, Norway. Convenors: Lene Buhl-Mortensen, Carsten Hvingel and Børge Holte (NOR), Francis Neat (UK) and Mariano Koen-Alonso (CAN);
- Symposium on “*Ecological basis of risk analysis for marine ecosystems*”, June 2–6, 2014, Helsinki, Finland. Convenors: Sakari Kuikka (FIN), Tony Smith (AUS).

FIS strongly supported the Symposium on “*Stock assessment methods*”. FIS members noted that FIS has supported session on both cod and gadids in the past, thus the gadid symposium is a good candidate. After some discussion it was decided that FIS would support PICES involvement in the Symposium on “*Fisheries dependent data*”. FIS noted that the topic of the symposium on effects of fishing on habitat directly fulfills an item in the FIS Action Plan and is consistent with FUTURE as well. Finally, FIS found interest in the Symposium on “*Ecological basis of risk analysis for marine ecosystems*”.

AGENDA ITEM 11

High priority projects

None

AGENDA ITEM 12

Other priority items with funding implications

Dr. Hollowed made a request for support for the inter-sessional FUTURE workshop to be organized by S-CCME and held in western Russia. Three invited speakers as well as involvement from WGs 27, 28, 29, MONITOR, and S-CCME. **FIS ranks this workshop as a high priority and would like to provide strong support.**

AGENDA ITEM 13

Proposed publications

No proposals for new publications were received.

Some FIS members believed that the Final Report of WG 24 on *Environmental Interactions of Marine Aquaculture* should be published as a PICES Scientific Report. The FIS chair explained that Science Board had decided in its inter-sessional meeting in May 2012 that if sections from China were not provided then the report would only be published on the web. **FIS would like to suggest to Science Board that the WG 24 Final Report be published in hard copy despite the lack of material from China.**

AGENDA ITEM 14

Inter-sessional activities, meetings and requests for travel support

FIS will contribute \$2,000 each for invited speaker travel support to PICES-2013 for its top two ranked Topic Session proposals; and \$1,000 for its third-ranked proposal.

AGENDA ITEM 15

Products listed in the FIS Action Plan

None discussed

AGENDA ITEM 16

Other business

None

FIS Endnote 1**FIS participation list**Members

Anya Dunham (Canada)
John Field (USA)
Yasuzumi Fujimori (Japan)
Toyomitsu Horii (Japan)
Jacquelynne King (Canada)
Libby Logerwell (USA, Chair)
Gordon Kruse (USA)
Mikhail Stepanenko (Russia)
Akihiko Yatsu (Japan)

Observers

Richard Beamish (retired, Canada)
Anne Hollowed (USA)
Yukimasa Ishida (Japan)
Masahide Kaeryiyama (Japan)
Adolf Kellerman (ICES)
Franz Mueter (ESSAS)
Peng Sun (China)
Yuko Takigawa (Japan)
Shigehiko Urawa (NPAFC)
Cisco Werner (ISC)
Yimin Ye (FAO)

FIS Endnote 2**FIS meeting agenda**

1. Welcome, introductions
2. Adoption of agenda
3. 2012 FIS Best Oral presentation and Poster awards
4. FIS Chairman's report: Implementation of PICES-2011 decisions
5. Update on FUTURE activities and review of FUTURE meeting

6. Status reports of FIS-sanctioned groups
7. Relations with other programs and organizations
8. Status report on FIS topic sessions and workshops for PICES 2013
9. Proposals for new FIS working groups and study groups
10. Proposals for new meetings/conferences with PICES as organizer
11. High priority projects
12. Other priority items with funding implications
13. Proposed publications
14. Inter-sessional activities, meetings and requests for travel support
15. Products listed in the FIS Action Plan
16. Other business

FIS Endnote 3

Proposals for Paper and Topic Sessions at PICES-2013

1. Contributed Paper Session

Sponsoring Committee: FIS
 Convenors: Xianshi Jin (China) and Elizabeth Logerwell (USA)
 Duration: 1 day
 Invited Speakers: none

2. Topic Sessions

Proposal for a 1-day Topic Session on “*Banking on recruitment curves; returns on intellectual investment*” [merged with ISC proposal on “*Pan-Pacific environmental variability and relationship to tuna/billfish/shark productivity and distributions*”]

During the first half of the 20th century, one of the fundamental issues in the then nascent discipline of fisheries science was determining how many individuals could be removed from a fish population without affecting its ability to keep producing fish for a fishery. In the 1950s, theoretical solutions to this problem were discovered in mathematical formulations that emerged from the work of Ricker, Beverton, Holt and others. These closed-form solutions led to widespread adoption as electronic computing technology became widely available in fisheries labs in the 1960s. Concepts that emerged from their equations underpin current estimation of biological reference points used to set harvest strategies for many of the world’s fisheries. Spawner-recruitment (S-R) curves serve as the foundation for what of a fish population remains to be conserved. With so much at stake, it is surprising that their application in contemporary fisheries is taken for granted. This session will delve into the good, the bad, and the ugly consequences of using recruitment curves, with an idea of determining whether an intellectual course correction is needed for the next 50 years. This topic session seeks papers that introduce new approaches to modeling the relationship between spawners and recruitment including: (1) incorporating predator prey interactions in S-R models, (2) use of coupled bio-physical models in identifying mechanisms linking spawners and recruitment, (3) consideration of the role of cohort resonance, (4) techniques for incorporating environmental variability into S-R functions, (5) stage-based S-R approaches, (6) comparative studies testing the performance of different methods relative to observations, and (7) decision rules regarding how to utilize knowledge of S-R relationships in formulating harvest advice. Enthusiasm for this topic session will be used to seek publication in a Special Issue in a primary journal.

Sponsoring Committees: FIS, TCODE

Co-convenors: Anne Hollowed (USA), Skip McKinnell (PICES), Hiroshi Okamura (Japan) and Cisco Werner (ISC)

Invited speakers: TBD

Proposal for a 1-day Topic Session on
“Science needs for offshore oil and gas development in the North Pacific”

Information is needed to advise agencies and institutions involved in offshore oil and gas (O&G) development and its regulation, clean-up, damage assessment and habitat restoration. Many of the information needs are similar to those of fisheries management, aquaculture, and pollution. They include: baseline data on population distribution, abundance and habitat use; effects of climate change and shifting baselines; ocean current and wind transport models. The purpose of this session is to introduce the PICES community to the processes and issues associated with O&G development, response and damage assessment, and to demonstrate how current and future research by PICES scientists could contribute to improved understanding. Presentations are sought on: applications of oceanic circulation models; factors affecting the distribution, abundance, habitat use, and population trends of zooplankton, fish, marine mammals, seabirds, and benthos; O&G development, including permitting and regulation; technologies and techniques used in exploration; damage assessment and restoration, physical and biological information needed for response and restoration planning; models of the fate of oil and its impacts; toxicology of oil to marine organisms; impacts on human communities and use of Traditional Ecological Knowledge.

Sponsoring Committees/Program: FIS, FUTURE

Co-convenors: Graham Gillespie (Canada), Elizabeth Logerwell (USA), Olga Lukyanova (Russia) and Lyman Thorsteinson (USA)

Invited speakers: TBD

The Marine Environmental Quality Committee

The business meetings of the Marine Environmental Quality Committee (MEQ) were held on October 14, 2012 (18:00 to 19:30 h) and on October 17, 2012 (14:00 to 18:00 h) in Hiroshima, Japan., Dr. Mitsutaku Makino, accepting the role of acting MEQ Chair after the unexpected stepping down of Dr. Steven Rumrill, called the meetings to order and welcomed 8 members from all PICES member countries and 14 observers (*MEQ Endnote 1*). The agenda was reviewed and adopted without modification (*MEQ Endnote 2*).

AGENDA ITEM 2

Implementation of PICES-2011 decisions

MEQ sponsored or co-sponsored the following Topic Sessions and Workshops at PICES-2012 in Hiroshima, Japan:

1. MEQ Topic Session 2 (½-day) *Range extension, toxicity and phylogeny of epiphytic dinoflagellates*. Co-convenors: William Cochlan (USA), Satoshi Nagai (Japan);
2. MEQ/FUTURE Topic Session 5 (1-day) *Social-ecological systems on walleye pollock and other commercial gadids under changing environment: Inter-disciplinary approach*. Co-convenors: Keith Criddle (USA), Suam Kim (Korea), Mitsutaku Makino (Japan), Ian Perry (Canada), Yasunori Sakurai (Japan), Anatoliy Velikanov (Russia);
3. BIO/MEQ/JSPPS Topic Session 6 (½-day) *Environmental contaminants in marine ecosystems: Seabirds and marine mammals as sentinels of ecosystem health*. Co-convenors: Peter Ross (Canada), Hideshige Takada (Japan), Yutaka Watanuki (Japan);
4. FIS/MEQ Topic Session 9 (½ day) *Ecological functions and services associated with marine macrophyte communities as indicators of natural and anthropogenic stressors in nearshore zones of the North Pacific*. Co-convenors: Ik-Kyo Chung (Korea), Jun Shoji (Japan);
5. BIO/MEQ/FUTURE/SOLAS Topic Session 10 (½ day) *Ecosystem responses to multiple stressors in the North Pacific*. Co-convenors: Vladimir Kulik (Russia), Ian Perry (Canada), Motomitsu Takahashi (Japan).
6. MEQ/FUTURE Topic Session 13 (½-day) *Risk management in coastal zone ecosystems around the North Pacific*. Co-Convenors: Masahide Kaeriyama (Japan), Thomas Therriault (Canada).
7. MEQ Workshop 6 (1½-day) *The contrasting cases of HABs in the eastern and western Pacific in 2007 and 2011*. Co-convenors: Changkyu Lee (Korea), Mark Wells (USA).

AGENDA ITEM 3

Relations with other programs/organizations

Dr. Peter Kershaw, representing the Group of Experts on Scientific Aspects of Marine Pollution (GESAMP), made presentation on their activities relevant to PICES, with special emphasis on WG37 on Metals [mercury] in the marine environment working group (UNEP, SIDA); WG38 on Atmospheric input of chemicals to the ocean (WMO, UNIDO, IMO, SCOR); WG39 on Establishment of trends in global pollution in coastal environments (IAEA, UNIDO); WG40 on Sources, fate and effects of micro-plastics in the marine environment (IOC, IMO, UNEP, UNIDO, NOAA, PE, ACC).

Mr. Sangjin Lee, Drs. Alexander Tkalin, and Masa Ohyama from Northwest Pacific Action Plan (NOWPAP) made a presentation on their Medium Term Strategy (2012–2017). MEQ recognized many common interests and the possibility of future collaboration in topics such as oil spills, marine litter, marine protected areas, invasive species, climate change, etc.

Dr. Elik Adler also attended the meeting as an observer representing the UNEP Coordinating Body on the Seas of East Asia (COBSEA).

MEQ 2011

AGENDA ITEM 4

Suggested theme for PICES-2014

No suggestions were presented.

AGENDA ITEMS 5 and 13

Other business

None.

AGENDA ITEM 6

Reports from MEQ expert groups

1. WG 21 on *Non-indigenous Aquatic Species* (2005–2012; Co-Chairs: Darlene Smith, Vasily Radashevsky)
 - Organized a Rapid Assessment Survey Demonstration workshop in Nagasaki, Japan (February 8–9, 2012), attended by 25 people from 7 countries;
 - Submitted its final report and brochure on PICES Nonindigenous Species Information System, the Atlas of Nonindigenous Marine and Estuarine Species in the North Pacific, and Rapid Assessment Survey Projects to MAFF (Japan);
 - Final report of the Working Group is now being prepared;
 - WG 21's next activities were discussed, and several options were identified (see Agenda Item 7).
2. WG 24 on *Environmental Interactions of Marine Aquaculture* (2008–2012; Co-Chairs: Ingrid Burgetz, Katsuyuki Abo, Brett Dumbauld)
 - Submitted its final report without contributions from China;
 - Held its final meeting at PICES-2013 on October 13, and the WG successfully finished its activities;
 - WG members recognized that environmental research on aquaculture is still important for PICES. So, aquaculture should be included in the revised MEQ Action Plan, with close coordination with FIS.
3. WG 28 on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (2011–2014; Co-Chairs: Ian Perry, Motomitsu Takahashi)
 - Organized S10 and W1 at this Annual Meeting;
 - Constructed a web-based questionnaire to experts on habitat vulnerability and stressors;
 - Prepared draft contents of the WG final report
4. Study Group on *Marine Pollutants* (2011 – 2012; Chair: Peter Ross)
 - Based on the identification of the hot topics in marine pollutants, the SG final report is being prepared;
 - Discussed future activities after the SG. Based on this, a proposal was made to establish a new section (Agenda Item 7);
 - Proposed one Topic Session and one Workshop for PICES-2013 (Agenda Item 9).
5. Section on *Ecology of Harmful Algal Blooms in the North Pacific* (2003-2014; Co-Chairs: Changkyu Lee, Vera Trainer)
 - Successfully organized local HAB training centers in the Philippines, Guatemala, and Indonesia as part of a PICES Seafood Safety Project funded by MAFF;
 - Identified the potential contributions and links to a new PICES/MAFF funded project on “*Marine ecosystem health and human well-being*”, and therefore have revised the Section's TOR;
 - Organized S2 and W6 at this Annual Meeting;
 - Proposed one Topic Session and one Workshop for PICES-2013 (Agenda Item 9).

AGENDA ITEM 7

Proposals of new expert groups

The following proposals were discussed at the MEQ meeting, but since MEQ did not have a revised Action Plan, the concepts of the Committee's activities are still very vague. (See Agenda Item 8 for a discussion on preparing an Action Plan.)

1. SG-MP (Chair, Peter Ross) proposed a new Section on "Emerging Topics in Marine Pollution" (S-ETMP).
 - 5 PICES member countries supported the proposal, and Canada abstained.
 - The relationship/linkage/demarcation with the proposed Radiation Working Group (see item #2) should be made clear.
2. Dr. Chuanlin Huo (MEQ China member) proposed a new Working Group on the "Assessment of Marine Environmental Quality of Radiation around North Pacific" (MEQR; *MEQ Endnote 3*).
 - The Chinese delegation confirmed that the State Oceanic Administration (SOA) of China will host a workshop before the next Annual Meeting in order to discuss more the proposed WG the relationship with other expert groups and to refine the Terms of Reference (TOR).
3. S-HAB (Co-Chair, Vera Trainer) proposed revised TOR.
 - The new TOR, linking closely with the new PICES project on "*Marine ecosystem health and human well-being*" funded by MAFF, should be discussed in 2013 after MEQ has revised its Action Plan.
4. WG 21 (Co-Chair, Darlene Smith) proposed activities after the end of WG 21's term.
 - WG 21 has largely finished its job and proposed four options for the further activities related to invasive species: 1) new Section, 2) new WG, 3) new AP, or 4) collaboration with SG-MP.
 - WG-21 needs some more time to finalize WG Final Report and prepare new TOR for the above options. So, MEQ agreed to recommend the extension of the WG's lifespan for one more year, and to discuss it at the 2013 Annual Meeting.

AGENDA ITEM 8

Review and revision of MEQ Action Plan

Based on the template made by the former MEQ Chair, Dr. Rumrill, Committee members submitted their opinions and views. Based on these, the new Chairman-elect (Dr. Chuanlin Huo) will organize a special task team to develop a draft of the revised MEQ Action Plan in order to discuss it at the next PICES Annual Meeting in Nanaimo, Canada.

AGENDA ITEM 9

Items with financial implications for 2013*Topic Session proposals for PICES-2013 ranked by MEQ*

1. *Ecosystem indicators to characterize ecosystem responses to multiple stressors in North Pacific marine ecosystems* (1 day; *WG 28 Endnote 5*) – 6 votes;
2. *Status, trends and effects of pollutants in coastal ecosystems: Implications for wildlife and humans* (½ day; *SG-MP Endnote 3*) – 6 votes;
3. *Science needs for offshore oil and gas development in the North Pacific* (1 day; *FIS Endnote 3*) – 5 votes;
4. *Aquatic invasive species in the North Pacific: integrating research and management* (1 day; [not accepted at the Science Board meeting]) – 4 votes;
5. *Emerging issues with Diarrhetic Shellfish Poisoning* (½ day; *S-HAB Endnote 4*) - 3 votes.

A ½-day MEQ Contributed Paper Session was also recommended.

MEQ 2011

Workshop proposals for PICES-2013 ranked by MEQ

1. *Traditional seafoods of the Snuneymux'w First Nation in Nanaimo, BC: insight into food, social and ceremonial uses* (1 day + field trip; SG-MP Endnote 4) – 6 votes;
2. *Economic impacts of harmful algal blooms on fisheries and aquaculture* (1½ day; S-HAB Endnote 4) – 3 votes.

Funds from MEQ

The allocation of Committee funding for invited speakers to Topic Sessions/Workshops is as follows:

- Ecosystem indicators: \$2500
- Pollutants: \$2000
- Traditional seafoods in First Nation: \$500

AGENDA ITEM 10

MEQ Best Presentation and Poster awards for PICES-2012

The Best Oral Presentation to an early career scientist for an MEQ-sponsored Topic Session/Workshop was presented to Kyung-Su Kim (Pukyong National University, Korea) for his talk on “The combined effects of elevated carbon dioxide concentration and temperature on the early development stage of olive flounder *Paralichthys olivaceus*” at Topic Session S10 (*Ecosystem responses to multiple stressors in the North Pacific*). Kanako Naito (Prefectural University of Hiroshima, Japan) received the Best Poster award for “*Iron as a triggering factor for harmful dinoflagellate blooms*”, also in S10. (For further details on award recipients see the list at the end of the Session Summaries section in the [2012 Annual Report](#).)

AGENDA ITEM 11

Report on FUTURE

A presentation was made by AP-AICE Chairman, Dr. Thomas Therriault, on FUTURE’s roadmap and the FUTURE Open Science Meeting scheduled for 2014. MEQ members had little time left for discussion.

AGENDA ITEM 12.

Election of the next Chair and Vice-Chair of MEQ

Before conducting the election among Science Board members, PICES Executive Secretary, Dr. Alexander Bychkov, explained the PICES procedure for electing a Committee Chairman. Dr. Chuanlin Huo was elected Chair, and Ms. Darlene Smith was elected as the Vice-Chair.

AGENDA ITEM 13

Other business

None.

MEQ Endnote 1**MEQ meeting participants**Members

Ik Kyo Chung (Korea)
 Chuanlin Huo (China)
 Hideaki Maki (Japan)
 Mitsutaku Makino (Japan, Vice-Chairman; Acting
 Chairman)
 Olga Lukyanova (Russia)
 Won Joon Shim (Korea)
 Darlene Smith (Canada)
 Thomas W. Therriault (Canada)
 Lyman Kaye Thorsteinson (USA)

Observers

Katsuyuki Abo (Japan)
 Ellik Adler (UNEP/COBSEA)
 Karin Baba (Japan)
 Liqi Chen (China)
 Yoichiro Ishibashi (Japan)
 Peter Kershaw (GESAMP)
 Sangjin Lee (NOWPAP)
 Masa Ohyama (UNEP/NOWPAP)
 Ian Perry (Canada)
 Annamalai Subramanian (Japan)
 Alexander Tkalin (NOWPAP)
 Vera Trainer (USA)
 Tokio Wada (Japan)
 Mark Wells (USA)

MEQ Endnote 2**MEQ meeting agenda**

Sunday, October 14, 2012 (18:00 – 19:30)

1. Welcome and adoption of agenda (Makino)
2. Implementation of PICES-2011 decisions (Makino)
3. Relations with other programs/organizations
4. Suggested theme for PICES-2014 (Makino)
5. Other business (Makino)

Wednesday, October 17, 2012 (14:00 – 18:00)

6. Reports from MEQ expert groups (WG 21, WG 24, WG 28, SG-MP, S-HAB)
7. Proposals of new expert groups (if any, tbd)
8. Review and revision of MEQ Action Plan (Makino)
9. Items with financial implications for 2013 (topic sessions, workshops, etc.) (Makino)
10. MEQ Best Presentation and Poster awards for PICES-2012 (Makino)
11. Report on FUTURE (Therriault)
12. Election of the next Chair and Vice-Chair of MEQ (Makino)
13. Other business (Makino)

MEQ Endnote 2

**Proposal to establish a Working Group on
the Assessment of Marine Environmental Quality of Radiation around North Pacific
[later changed to a Study Group on Radionuclide Science in the North Pacific Ocean]**

Background

The widespread application of nuclear science and technology has led to increasing amounts of radionuclides being released directly or indirectly into the ocean. Radioactive pollution is becoming a key issue concerned by marine research scientists, especially when a nuclear accident happens.

A large amount of radioactive contaminant was released into the North Pacific from a recent nuclear accident, and the long half-life radionuclides will stay in the marine environment for a long time and possibly endanger the marine ecosystem or human-being health through food chains. Thus it is very important to monitor the radiation exposure level and assess the effects of radioactive substances on marine ecosystem in the North Pacific waters.

A Working Group was proposed to exchange and share the technologies and experiences on the monitoring of the radioactive contaminants in the North Pacific waters, to assess the relevant effect and radiological risk in waters, to promote public understanding of radiation effects and to encourage the enactment of more reasonable regulations concerning the use of radiation. The proposed terms of reference were:

1. To unify the detecting methods of concerned nuclides in PICES member states;
2. To discuss and implement intercalibration of NIT (Nuclear Isotopic techniques) in PICES member states;
3. To exchange and select the assessment methods of marine environmental quality of radiation (MEQR) among PICES member states;
4. To recommend the reference organism species in the North Pacific waters;
5. To assess the current marine environmental quality of radiation of the North Pacific waters;
6. To compile a list of existing databases of MEQR experts of the North Pacific for academic exchange;
7. To promote collaboration among PICES member states.

To provide an opportunity for greater discussion of the proposal among scientists in PICES member countries, Science Board recommended a Study Group to:

1. Convene a workshop in China to provide a forum for exchange of views among scientists on the idea of developing a scientific focus on understanding the quantities and distributions of radionuclides in the North Pacific;
2. To refine the WG terms of reference proposed by China in consideration of wider interests of scientists in PICES member countries, including relevance to the FUTURE/AICE mandate;
3. To develop a list of potential WG members;
4. To prepare a report with recommendations for future PICES activities and products related to the topic that are consistent with new MEQ Action Plan;
5. To make the report available by the inter-sessional Science Board meeting in May 2013.

Suggested members

Chairman: A senior scientist on marine radioecology from China and a senior scientist on Marine Radioecology from the eastern North Pacific.

Recommended Chairman:

Yusheng Zhang, Third Institute of Oceanography, State Oceanic Administration (SOA).

The Physical Oceanography and Climate Committee

An overture meeting of the Physical Oceanography and Climate Committee (POC) took place in Hiroshima, Japan, from 18:00–19:30 h on October 14, 2012. POC Chairman, Dr. Kyung-Il Chang, called the meeting to order, circulated the draft agenda, and introduced key issues that needed in-depth discussion and decision at the POC meeting on October 17, 2012. Judges for 2012 POC Best Presentation and Poster Awards were nominated: Drs. Kyung-Il Chang, Michael Foreman, Yury Zuenko.

The second POC meeting was held at from 14:00-18:00 h on October 17, 2012. The Chairman called the meeting to order and welcomed members and observers (*POC Endnote 1*). Dr. Chang introduced two new POC members, Drs. Zhenya Song and Lei Zhou representing China, to replace Drs. Dake Chen and Zhanggui Wang (*POC Endnote 2*). The new members contacted the Chairman before the Annual Meeting, and asked the Chairman to deliver their regrets to POC members not to be able to attend the meeting due to various reasons. Dr. Michael Foreman, Vice-Chairman of POC, agreed to act as a rapporteur. The draft agenda presented at the overture POC meeting was adopted (*POC Endnote 3*).

AGENDA ITEM 4

Completion of PICES-2011 decisions

1. Travel support request for a PICES representative to attend the CLIVAR Pacific Implementation Panel meeting held in Noumea, New Caledonia, on April 29–May 1, 2012, was approved. (Shoshiro Minobe, Co-Chair of WG 27).
2. Travel support request for a PICES convenor for the Workshop on “*Climate change projections for marine ecosystems: Best practice, limitations and interpretation*” to be held at the 2nd International Symposium on “*Effects of climate change on the world’s oceans*”, May 13–14, 2012, Yeosu, Korea. (Enrique Curchitser, Co-Chair of WG 29).
3. Proposed 1-day POC Contributed Paper Session was approved for PICES-2012.
4. Proposed 1-day POC Topic Session S3 on “*Challenges in understanding North Hemisphere climate variability and change*” was approved for PICES-2012 (5 invited speakers, co-sponsored by CLIVAR and ICES).
5. Proposed ½-day FIS/MONITOR/POC Topic Session S4 on “*Monitoring on a small budget: Cooperative research and the use of commercial and recreational vessels as sampling platforms for biological and oceanographic monitoring*” was approved for PICES-2012 (1 invited speaker).
6. Proposed ½-day POC/FIS Topic Session S8 on “*Linking migratory fish behavior to end-to-end models II*” was approved for PICES-2012 (1 invited speaker).
7. Proposed 1-day MONITOR/POC Topic Session S11 on “*Effects of natural and artificial calamities on marine ecosystems and the scheme for their mitigation*” was approved for PICES-2012 (5 invited speakers, co-sponsored by JSFO and FRA).
8. Proposed ½-day BIO/FIS/POC Topic Session S12 on “*Advances in understanding North Pacific Subtropical Frontal Zone ecosystem*” was approved for PICES-2012 (1 invited speaker).
9. Proposed 1-day POC/TCODE Topic Session S14 on “*Changing ocean biogeochemistry and its ecosystem impacts*” was approved for PICES-2012 (3 invited speakers, co-sponsored by CLIVAR, IMBER, and SOLAS).
10. Proposed 1-day ESSAS/PICES Workshop W4 on “*Subarctic-Arctic interactions*” was approved for PICES- 2012 (3 invited speakers, co-sponsored by ESSAS).

AGENDA ITEM 5

Reports of active POC expert groups

Full reports of POC’s expert groups can be found elsewhere in the [2012 Annual Report](#). Brief highlights are given below.

POC-2012

Section on *Carbon and Climate* (S-CC)

Dr. James Christian, Co-Chairman of S-CC, reported the Section's 2012 activities and 2013 plans. The PACIFICA dataset was opened in May 2012, and a unified data product is now being produced, to be opened by the end of 2012. Documentation and analysis activities for the unified PACIFICA data product will follow. A SOLAS Summer School will be held in Xiamen, China, on August 23–September 2, 2013. S-CC supports a SOLAS request for PICES to provide travel funds for three early career scientists from PICES member countries to attend. S-CC has proposed a 1-day POC/BIO Topic Session for PICES-2013 on “*The changing carbon cycle of North Pacific continental shelves and marginal seas*”, and requested support for one invited speaker. S-CC plans to have ½-day business meeting at PICES-2013. POC approved all requests from S-CC.

Joint PICES/ICES Section on *Climate Change Effects on Marine Ecosystems* (S-CCME)

Dr. Anne Hollowed, Co-Chairman of S-CCME, summarized the Section's 2011/2012 activities and future plan, and sent the summary document to the POC Chairman prior to the POC meeting.

Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas* (AP-CREAMS)

Dr. Kyung-Il Chang, a member of CREAMS-AP, gave a brief report of the Panel on its activities in 2011 and plans for 2012 and beyond. Since its meeting at Khabarovsk, Russia, during the 2011 PICES Annual Meeting, AP-CREAMS meetings were held twice in 2012, in Yeosu, Korea, on May 18, and in Hiroshima, Japan, on October 14 during the 2012 PICES Annual Meeting. National activities were presented including joint scientific cruises among AP members' countries, a Korea–Russia cruise in the Japan/East Sea and two China–Japan–Korea cruises in the East China Sea. The joint cruises will also be conducted in 2013 in both regions. The revised supplement to the 2010 North Pacific Ecosystem Status Report on the Japan/East Sea, after receiving comments from MONITOR and AP-SOFE, was prepared by AP-CREAMS and submitted to PICES.

Publication of an extensive status report or review of the EAST-II region was discussed and members in attendance agreed to establish an *ad hoc* committee to decide the format and scope of the report. Tentative *ad hoc* committee members were nominated and further discussion on preparing the report will be made during the PEACE meeting in Japan on November 28–29, 2012 and/or 17th PAMS meeting in China on April 23–25, 2013.

AP-CREAMS supports a NOWPAP request for travel support for one lecturer and some students to attend the 4th CEARAC/NOWPAP training course on “*Remote sensing data analysis*” in Qingdao, China, in 2013. AP-CREAMS was also requested to endorse a proposal for summer school on ecosystem modeling in 2014, prepared by Dr. K.-R. Kim. POC approved all requests from AP-CREAMS.

Working Group on *North Pacific Climate Variability and Change* (WG 27)

Dr. Emanuele Di Lorenzo, Co-Chairman of WG 27 (<http://wg27.pices.int>), gave a brief presentation on 2012 activities and future plans for WG 27. Objectives and terms of reference were reviewed, and the successful GLOBEC/PICES/ICES workshop on “*Forecasting ecosystem indicators with process-based models*” (ECOFOR Workshop) held in Friday Harbor Labs., Washington, USA on September 7–11, 2012, was reported (a report of ECOFOR is available at <http://wg27.pices.int/ecofor>). The importance of collaboration and exchange among marine ecosystem scientists and physical oceanographers, including climate scientists, in linking ecosystem response to climate forcing was highlighted during the workshop and recommendations were made to PICES and ICES. As the follow-up to the workshop, a 2013 ICES ASC Theme Session and PICES-2013 Workshop were proposed on “*Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for future*”. Another ECOFOR Workshop is being planned.

A Topic Session on “*Challenges in understanding Northern Hemisphere ocean climate variability and change*” (S3) led by WG 27 took place during the 2012 PICES Annual Meeting, and was well attended. Following the session, invited speakers from outside the PICES community and WG 27 members had a meeting to plan joint activities and team building targeted on “*Process modeling of large-scale ecosystem processes*”. Dr. Shoshiro

Minobe, Co-Chairman of WG 27, reported on his attendance at the 7th CLIVAR Pacific Panel meeting in Noumea, New Caledonia, on April 29–May 1, 2012. At the meeting, Dr. Minobe proposed that new CLIVAR after 2013 should widen its scope by including marine ecosystem and biogeochemical cycles in one of its scientific themes (*POC Endnote 3*). The proposal was reflected in grand challenges for new CLIVAR as “Marine biophysical interactions and dynamics of upwelling systems”. To build on the collaboration with CLIVAR, Dr. Minobe proposed a joint PICES/CLIVAR workshop in 2013 and requested PICES travel support for two PICES members, one from WG 27 and the other from other PICES members. A recent update of this proposal can be found in *POC Endnote 4*. POC approved requests from WG 27. See the WG 27 website (<http://wg27.pices.int>) containing all related materials, publications, and report.

Working Group on *Regional Climate Modeling* (WG 29)

Dr. Enrique Curchitser, Co-Chairman of WG 29, gave a brief summary of activities and plans of WG 29. During its first business meeting on October 12, 2012, Dr. Curchitser and Co-Chair, Dr. Chan Joo Jang, prepared a status of regional ocean or ocean–atmosphere coupled downscaling activities in the North Pacific from the PICES member countries. The status map contains the domain of each model and model resolutions both in the horizontal and vertical. The roadmap of WG 29, which contains annual major tasks of WG 29 between 2012 and 2014 focusing on the evaluation of regional models and analyses of CMIP5 results, was also shown. Contributions to the FUTURE outcome and outputs were also shown and discussed. Upcoming activities of WG 29 include a Topic Session on “*Recent trends and future projections of North Pacific climate and ecosystem*” for PICES-2013, and an inter-sessional workshop on “*Regional Climate Modeling – II*” to be held in Korea in September 2013. An observer, Dr. Ken Drinkwater, suggested the workshop link to ICES or other Atlantic modelers. WG 29 requested PICES travel support for two PICES members as invited speakers to the workshop. POC approved the request, with strong support for the Topic Session and the workshop. BIO became the other parent committee of WG 29 after a request from BIO Chairman, Dr. Atsushi Tsuda, during the inter-sessional Science Board meeting in May 2012. Dr. Angelica Peña is the BIO member of WG 29.

AGENDA ITEM 6

Relations with other international organizations/programs

The following four brief presentations were given.

1. Dr. Toshio Suga gave summary of Argo activities on behalf of Dr. Howard Freeland. The number of Argo profiles will be 1 million by November 2012. Four issues for sustaining Argo were presented including a continuing focus on technology improvement and data management to reduce systematic errors in pressure and salinity and to avoid or identify major technical failures. Also given were new objectives of Argo: deployments in high latitudes and marginal seas, denser arrays in the boundary currents, improved surface layer sampling, enhanced vertical resolution, and expansions to deep ocean profiling and multi-disciplinary sensors such as dissolved oxygen, chlorophyll, nutrients, and pH. Contributions to Argo are to provide high-quality CTD data for re-calibration of Argo data, to provide information on cruises to unusual parts of the world oceans, and to support the Argo Information Center. Argo contact person is Mathieu Belbeoch, the Argo Technical Coordinator (belbeoch@jcommops.org).
2. Dr. Toshio Suga, representing the CLIVAR Pacific Panel, introduced post-2013 WCRP core projects that include new CLIVAR. Current CLIVAR will end in 2013, and the new CLIVAR will have a different organization of cross-cutting and regional panels. There will be the same Pacific Implementation Panel as that in the current regional panel. New CLIVAR research challenges were introduced including “Marine biophysical interactions and dynamics of upwelling system” as was mentioned by Dr. Shoshiro Minobe (Co-Chairman of WG29). POC members were curious why the specific topic, dynamics of upwelling systems, was recommended, and Dr. Suga said he will contact Dr. Martin Visbeck, Co-Chairman of CLIVAR SSG, to ask for further information. A proposal for future collaboration between CLIVAR and PICES, given by Dr. Minobe during the 7th CLIVAR Pacific Panel meeting, was also introduced. To strengthen links with PICES, CLIVAR co-sponsored the POC Topic Session “*Challenges in understanding Northern Hemisphere ocean climate variability and change*” at PICES-2012, and proposed a joint workshop between PICES and the CLIVAR Pacific Panel in 2013 (see *POC Endnote 4*).

POC-2012

3. Dr. Ken Drinkwater, Co-Chairman of ESSAS (Ecosystem Studies of Subarctic Seas), gave a brief presentation on ESSAS and its activities, the goal of ESSAS, and ESSAS Open Science Meeting in May 2012, with a special volume of publications being developed. ESSAS activities in 2012 involved an ESSAS/ICES Workshop at the PICES/ICES/IOC Climate Change Symposium held in Yeosu, Korea, ESSAS/PICES/ICES/ASOB theme session at the ICES ASC, and ESSAS/PICES/ICES Workshop on “*Arctic-Subarctic interactions*” at PICES-2012. The ESSAS 2013 Annual Science Meeting (ASM) will be held in Hakodate, Japan on January 7–9, 2013 with an overall theme of “Spatial Dynamics”. An ESSAS new working group on “Human Dimensions” and “Bioenergetics” could be formed during their ASM. A request was made to send at least one PICES scientist to attend the ESSAS ASM in Hakodate.
4. Dr. Lisa Miller provided a summary of SOLAS organizational issues. The 6th SOLAS Summer School will be held in Xiamen, China on August 23–September 2, 2013. The Summer School expects about 70 graduate students and will consist of 26 lectures and 5 practical workshops. A follow-up survey indicated that previous SOLAS summer schools provide a good scientific partnership among alumni of the schools. PICES support was requested to send three students to the 6th Summer School, which would cost about \$7,500.
5. At PICES-2011, PICES decided to support SCOR Working Group 140 – Biogeochemical Exchange Process at the Sea Ice Interfaces (BEPSE II) and recommended Dr. Lisa Miller as an associate member, representing PICES. Dr. Miller introduced the Working Group, co-chairs, terms of reference, and three task groups and their roles. The associate members have not yet been finalized, but Dr. Miller did not anticipate a problem, and requested PICES support to travel to the Working Group meeting in 2013.
6. Dr. Hee-Dong Jeong, NEAR-GOOS Coordinating Committee member, introduced the NEAR-GOOS regional observing system including ship-of-opportunity monitoring and a joint Japan–Russia survey in the Japan/East Sea, and a network of automated sea level stations in Russia.
7. Dr. Steven Bograd introduced the Central and Northern California Ocean Observing System (CeNCOOS), one of the components of U.S. Integrated Ocean Observing System (IOOS). CeNCOOS supports an “end-to-end” coastal ocean observing system based on shore stations, HF radar network, profiling gliders, and numerical models. CeNCOOS data products and data portal for accessing the products were also introduced.
8. There was a request from the Science Board Chair at the 2012 PICES inter-sessional Science Board meeting to review new SCOR Working Group proposals. POC supported one of proposals on “Surface Waves in Ocean Circulation and Climate System”.
9. Dr. Yutaka Michida, Vice-Chair of IOC, and Dr. Satoru Taguchi, SCOR Vice-President, gave presentations on both organizations and possible cooperation with PICES at the Science Board meeting on October 14. The POC Chairman then introduced their presentations to the POC Committee, focusing on possible linkages to POC such as the SCOR Visiting Scholars program, the POGO-SCOR Fellowships for Operational Oceanography, proposing and co-sponsoring SCOR working groups, and involvement of PICES scientists in the WESTPAC (sub-commission of IOC) program, like ocean acidification research.
10. The POC Chairman received and reviewed 18 theme session proposals for the ICES ASC to be held in Iceland in September 2013, and discussed the possible co-sponsorship of the sessions, focusing on the following 4 sessions; “Physico-chemical aspects of ocean acidification in the ICES area”, “Hydrographic processes, circulation, and water mass formation in the polar and subpolar basins”, “Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for the future” with Dr. E. Di Lorenzo, Co-Chair of WG 29, as a Co-Convenor, and “Responses of living marine resources to climate change and variability: Learning from the past and projecting the future” with Dr. Anne Hollowed, Co-Chair of S-CCME, as a Co-Convenor.

AGENDA ITEM 7
POC Action Plan

The POC Action Plan, based on the updated PICES Strategic Plan, was prepared by the POC Chairman, and reviewed and modified by the Vice-Chairman (*POC Endnote 5*). The Action Plan will be circulated among the members before submitting the final Action Plan to Science Board at the ISB-2013.

AGENDA ITEM 8
Update on FUTURE

POC expert groups, WG 27, WG 29, S-CCME, gave their summaries of activities related to FUTURE at the FUTURE meeting held on October 14 during PICES-2012. At the POC meeting, discussion about FUTURE was focused on three issues, and comments from the discussion for each issue are as follows.

1. Proposal for Production of the North Pacific Ecosystem Status Report (NPESR)
 - An annual web-based NPESR product would be beneficial but a possible problem of quality control of data was raised. In that regard, a bi-annual product may be better.
 - Annual NPESR could be published as a supplement to major journals like the supplement of the Bulletin of the American Meteorological Society (BAMS), State of the Climate in 2011, BAMS, Vol. 93, No. 7. (<http://www.ncdc.noaa.gov/bams-state-of-the-climate/2011.php>)
 - It should be easy to take information from member countries' on-going state of ocean reports such as Canadian State of the Ocean Report. (http://www.dfo-mpo.gc.ca/science/coecde/soto/documents/dfo_soto/english/index-eng.htm#a5).
 - Establishment of a Study Group to work on the production of NPESR was also suggested.
 - The annual or bi-annual production of NPESR would benefit from on-going regional observation programs such as CeNCOOS and NEAR-GOOS.
 - Nowcast/forecast model products could also be exploited for more frequent NPESR productions, but model results need validation.
 - The POC Chairman will contact POC members of each member country to provide what kind of physical parameters and data will be available in each country for an annual-based production of NPESR.
2. FUTURE roadmap prepared after the FUTURE Workshop in Busan, Korea, in May 2012
 - The Science Board Chairman asked each Committee member to consider necessary expert groups after the current expert groups expire. POC expert groups related to FUTURE, WG 27, WG 29, and S-CCME, were established in 2011 and 2012, and it may be premature to consider the next necessary expert groups until after the disbandment of these groups, between 2014 and 2016.
 - To accomplish the goal of FUTURE, analyses and evaluation of climate model results (AR4 and CMIP5) are very important. Currently WG 29 is working on it, and these efforts should be continued after the disbandment of WG 29.
 - A working group on end-to-end modeling is required to model the response of upper trophic levels to climate change.
3. FUTURE Open Science Meeting in 2014

A FUTURE Open Science Meeting (OSM) will be held in Hawaii in April 2014. The main objectives are the evaluation of FUTURE to date and the adjustment of its direction if necessary.

 - Dr. Shin-ichi Ito suggested the following themes and structure of the OSM:
 - Theme 1: What determines intrinsic resilience and vulnerability?
 - Theme 2: How do ecosystems respond to forcing and how might that change in the future?
 - Theme 3: How do human activities affect coastal ecosystems and how are societies impacted?
 - Theme 4: FUTURE current status and its perspectives.

POC-2012

- Each theme from 1 to 3 to have a plenary session in the morning and parallel sessions in the afternoon;
- Theme 4 to have a plenary session including concluding remarks from 3 themes and discussion about the future of FUTURE;
- OSM duration to be 4 days;
- Consider workshop(s) before OSM, and a public seminar after OSM;
- Important to consider an active involvement of early career scientists;
- Consider whether OSM is open to policy makers, non-governmental groups, and fisheries industries as well as researchers;
- Comments on who and how to evaluate FUTURE progress;
- Review from invited external reviewers (also invited speakers);
- Also review from general participants outside PICES;
- Reports from expert groups;
- Each theme per whole day rather than parallel sessions every day for effective evaluation;
- Preparation of evaluation sheet and questionnaire.

AGENDA ITEM 9

Planning for PICES-2013

1. Six POC/expert group co-sponsored Topic Sessions were proposed for PICES-2012 as well as a POC Paper Session. Ranking of the proposed sessions was led by Dr. James Christian (*POC Endnote 6*). Allotment of POC money for selected sessions was discussed and entrusted to the POC Chairman to decide. Finally, the following allotment was determined: “*Recent trends and future projections of North Pacific climate and ecosystem*” (\$3,000), “*The changing carbon cycle of North Pacific continental shelves and marginal seas*” (\$1,500), and “*Are marine ecosystems of the North Pacific becoming more variable ?*” (\$500).
2. Two POC/expert group sponsored workshops were proposed (*POC Endnote 7*).
3. ½-day business meetings for S-CC, S-CCME, AP-CREAMS, WG 27, and WG 29 were proposed.
4. Two capacity building programs in 2013 and beyond were supported by POC (*POC Endnote 8*).

AGENDA ITEM 10

Publications for 2013 and beyond

A special issue in the Journal of Marine Systems on “*Modeling of marine ecosystem dynamics and the use of observations for improving models*” dedicated to Dr. Bernard Megrey was proposed with guest editors, Enrique Curchitser and Shin-ichi Ito, and approved at PICES-2011. There was a change of the journal to Progress in Oceanography.

AGENDA ITEM 11

Items with financial implications

1. Proposed inter-sessional meetings for 2013 and beyond supported by POC
 - ICES ASC Theme Session on “*Ocean acidification*” (S-CC);
 - Inter-sessional FUTURE Workshop (S-CCME);
 - ICES/PICES Topic Sessions at 2013 ICES ASC (S-CCME, WG 27);
 - Joint CLIVAR/PICES Theme Session on “*Biophysical interactions*” at the International Symposium on “*Boundary Current dynamics: Its connection with open-ocean, coastal processes, biophysical interactions and responses to global climate change*”, to be held on July 8–13, 2013, in Lijiang, China (WG 27);
 - 2nd RCM Workshop to be held in Korea in September 2013 (WG 29).

2. Proposed inter-sessional capacity building programs for 2013 and beyond supported by POC
 - 2013 SOLAS Summer School (S-CC);
 - 2013 NOWPAP training course on “*Remote sensing data analysis*” in Qingdao, China, in fall 2013 (AP-CREAMS);
 - 2014 PICES Summer School on “*Ecosystem modeling*” in Korea in August 2014 (AP-CREAMS)
3. POC ranked the following list of PICES travel support requests among the above inter-sessional meetings:
 - travel support for 2 scientists to attend the joint CLIVAR/PICES Theme Session including 1 WG 27 co-chair (Dr. Shoshiro Minobe);
 - travel support for 2 PICES members to attend the 2nd RCM Workshop (Seoul National University will support another approximately 12 invited speakers.);
 - travel support for 1 S-CC member to attend the 2013 ICES ASC Theme Session (This request was withdrawn because an available S-CC member could not be found.)
4. POC approved support for the following capacity building programs:
 - travel support for 1 lecturer and students for a NOWPAP training course on “*Remote sensing data analysis*”;
 - travel support for 3 early career scientists from PICES member countries to attend the 2013 SOLAS Summer School.

AGENDA ITEM 12

POC Best Presentation and Poster awards

Drs. Kyung-Il Chang, Michael Foreman, and Yury Zuenko were judges for the best early career scientist oral presentation and best poster at the POC Paper Session and Topic Sessions S3, S4, S8, S11, S12, and S14. The POC Best Presentation Award was given to Yoshi N. Sasaki (Japan) for “*Interannual to decadal variability of the Gulf Stream and Kuroshio Extension jets*” presented at S3 Topic Session. The POC Best Poster Award was given to Sachihiko Itoh (Japan) for “*Strong vertical mixing in the Urup Strait, Kuril Islands*” presented at the POC Poster Session. Further details on best presentations can be found at the end of the Session Summaries section in the [2012 Annual Report](#).

AGENDA ITEM 13

Documenting Topic Sessions and Workshops

POC Chairman recalled the request from Science Board to complete and send documentation of topic sessions for PICES-2012 to the PICES Secretariat before the end of the Annual Meeting, and meeting reports of POC and expert groups within one month after the Annual Meeting.

AGENDA ITEM 14

Other business

POC reviewed and decided to support a proposal to establish a new Section on ‘Emerging Topics in Marine Pollution’ submitted by the Study Group on *Marine Pollution*.

AGENDA ITEM 15

Adoption of report and recommendations to Science Board

This POC report was circulated among, and approved by, all POC members. All recommendations were brought by Dr. Kyung-Il Chang to Science Board meeting on October 19–20, 2012.

POC-2012

POC Endnote 1

POC participation list

Members

Steven Bograd (USA)
Kyung-Il Chang (Korea, Chairman)
James Christian (Canada)
Enrique Curchitser (USA)
Michael Foreman (Canada, Vice-Chairman)
Shin-ichi Ito (Japan)
Chan Joo Jang (Korea)
Hee-Dong Jeong (Korea)
Elena Ustinova (Russia)
Yury Zuenko (Russia)

Observers

Josef Cherniawsky (Canada)
Patrick Cummins (WG 27)
Seth Dainelson (USA)
Ken Drinkwater (ESSAS)
Victor Kuzin (Russia)
Emanuele Di Lorenzo (WG 27)
Lisa Miller (SOLAS, SCOR WG 140)
Shoshiro Minobe (WG 27)
Jae-Hun Park (Korea)
Young-Gyu Park (Korea)
Toshio Suga (Argo, CLIVAR)
Olga Trusenkova (Russia)

POC Endnote 2

POC meeting agenda (revised after the overture POC meeting)

1. Welcome, introductions, opening remarks
2. Membership changes
3. Changes to, adoption of agenda and appointment of rapporteur
4. Completion of PICES-2011 decisions
5. Reports of POC active groups
 - i) Section on Carbon and Climate (Christian)
 - ii) Joint PICES/ICES Section on Climate Change Effects on Marine Ecosystems
 - ii) Advisory Panel for a CREAMS/PICES Program in East Asian Marginal Seas (Chang)
 - iii) Working Group on North Pacific Climate Variability and Change (Di Lorenzo and Minobe)
 - iv) Working Group on Regional Climate Modeling (Curchitser)
6. Relations with other international organizations/programs
 - i) Argo (Suga)
 - ii) WCRP/CLIVAR (Suga)
 - iii) ESSAS (Drinkwater)
 - iv) SOLAS (Miller)
 - v) SCOR Working Group 140 (Miller)
 - vi) NEAR-GOOS (Jeong)
 - vii) CeNCOOS (Bograd)
 - viii) Review and support of SCOR Working Group proposal on Surface Waves in Ocean Circulation and Climate System
 - ix) IOC and SCOR (Dr. Kyung-Il Chang on behalf of Drs. Yutaka Michida and Satoru Taguchi)
 - x) Review of ICES ASC theme session proposals (Chang)
7. POC Action Plan discussion
8. Update on FUTURE
 - i) Draft proposal for production of the North Pacific Ecosystem Status Report
 - ii) FUTURE roadmap
 - iii) FUTURE Open Science Meeting in 2014
9. Planning for PICES-2013
 - i) Ranking and allotment for proposed six Topic Sessions
 - ii) Three Workshops proposed by POC or its active groups
 - iii) Business meetings of active groups

- iv) Capacity building programs in 2013 and beyond
- 10. Publication for 2012 and beyond
- 11. Items with financial implications
 - i) Proposed inter-sessional meetings for 2013 and beyond
 - ii) Proposed inter-sessional capacity building programs for 2013 and beyond
 - iii) Requests for PICES travel support for inter-sessional meetings
 - iv) Requests for PICES support for capacity building programs
- 12. POC Best Presentation and Poster awards
- 13. Documenting sessions and workshops
- 14. Other business
- 15. Adoption of POC report and recommendations to Science Board

POC Endnote 3

Recommendation to CLIVAR for a better collaboration across the blue and green oceans

Background

In recent years, it has become apparent that the oceans are undergoing substantial changes in a number of aspects, spanning the physical environment, biogeochemical cycles and marine ecosystems. Some changes may be associated with natural climate variability but others are related to anthropogenic forcing mainly due to post-industrial emissions of carbon dioxide. Examples of these changes are the reduction of water mass formation associated with air-temperature warming, the ocean's acidification due to atmospheric and thus ocean CO₂ concentration increases (Doney *et al.* 2009), and the reduction of dissolved oxygen caused by a SST increase and reduction of ventilation (Keeling *et al.* 2010). The ocean's acidification at depth is also closely related to water mass formations. The expansion of an oxygen minimum zone in the equatorial Pacific is related to thermocline variations (Deutsch *et al.* 2011). Also, the physical transport of nutrients across the base of euphotic zone, where photosynthesis occurs, is crucial for food-web dynamics. These changes in the physical properties of the ocean and resultant changes in marine biogeochemical cycles and ecosystems are inducing a degradation of ecosystem services on which our society depends. The sustainable use of marine ecosystem services under increasing anthropogenic forcing is an urgent issue to be resolved.

Recommendation to CLIVAR

How climate systems control biogeochemical cycles and ecosystem dynamics in present-day oceans and how the future climate will change them are essential questions for our society. Many physical processes controlling biogeochemical cycles and ecosystems are still not adequately known. These processes include ocean vertical and horizontal mixing associated with the mixed layer; horizontal and vertical advection due to sub-mesoscale and meso-scale phenomena; the transports of jets, striations and currents; water mass formation and ventilation; and air-sea interaction over SST fronts and eddies. The understanding of these processes for the present ocean and estimating future changes in them should be a basis of future projections of the earth system. The investigation of physical processes responsible for these biogeochemical and ecological impacts are not well covered by the current scope of programs under the WCPR. This is in contrast to the importance of the ocean and its interactions with the atmosphere were given in the successful studies by TOGA for the equatorial Pacific and that have been expanded globally by CLIVAR. Therefore, we strongly recommend that in their future endeavors CLIVAR, or Post-CLIVAR, assign appropriate weights to the understanding of physical processes that influence the biogeochemical cycles and marine ecosystems. For example, "variability and change of physical processes of the global oceans impacting on biogeochemical cycles and marine ecosystems" could be one of main themes for these programs, and could be studied by using field observations, data analysis and numerical modelings.

Studies with the foregoing themes should be lead by CLIVAR, or post-CLIVAR, with a close collaboration of climatologists/physical oceanographers and scientists with biogeochemical and biological disciplines under a proper international framework. Integrated Marine Biogeochemistry and Ecosystem Research (IMBER), the core program of IGBP and SCOR, focuses on marine biogeochemical and ecological studies. It's worth

pointing out that one of the themes of IMBER is “Responses of society”. Collaboration with IMBER is advantageous and could contribute to CLIVAR products that solve the emerging issues of society in the Global Change Era. In the North Pacific, PICES (The North Pacific Marine Science Organization) has carried out several interdisciplinary marine science programs. PICES recently launched an integrated program FUTURE to understand how marine ecosystems in the North Pacific respond to climate change and human activities. FUTURE has developed new Working Groups on *North Pacific Climate Variability and Change* (WG 27) and *Regional Climate Modeling* (WG 29). Physical oceanographers and biogeochemical oceanographers have been tightly collaborating in these activities. FUTURE and FUTURE-related national programs would be desirable partners for the CLIVAR Pacific Panel in their interdisciplinary collaborations.

References

- Deutsch, C., H. Brix, T. Ito, H. Frenzel, and L. Thompson, 2011: Climate-forced variability of ocean hypoxia. *Science*, 333, 336-339, doi: 10.1126/science.1202422.
- Doney, S. C., V. J. Fabry, R. A. Feely, and J. A. Kleypas, 2009: Ocean acidification: The other CO₂ problem. *Annu. Rev. Mar. Sci.*, 1, 169–192, doi:10.1146/annurev.marine.010908.163834.
- Keeling, R. F., A. Körtzinger, and N. Gruber, 2010: Ocean deoxygenation in a warming world. *Annu. Rev. Mar. Sci.* 2, 199–229, doi: 10.1146/annurev.marine.010908.163855.

POC Endnote 4

Announcement of a joint CLIVAR/PICES Theme Session

At the 2012 PICES Annual Meeting, a proposal was approved for an inter-sessional joint CLIVAR/PICES workshop in 2013, with travel support for two PICES members. After a discussion with the Chairman of the CLIVAR Pacific Panel, it was decided instead to have a ½-day joint CLIVAR/PICES Theme Session on “*Biophysical interactions*” at the 2-day International Symposium on “*Boundary Current dynamics: Its connection with open-ocean, coastal processes, biophysical interactions and responses to global climate change*”, to be held between July 8–13, 2013, in Lijiang, China. The Co-Chairman of the PICES Working Group on *North Pacific Climate Variability and Change* (WG 27), Dr. Shoshiro Minobe (Hokkaido University, Japan) will serve as the PICES Convenor for this session. Dr. Xiaopei Lin (Ocean University of China), also a member of WG 27, is the Symposium local organizer.

The joint CLIVAR/PICES Theme Session on “*Biophysical interactions*” will be one of 4 scientific sessions of the Symposium, and key questions for this session will be:

- What roles do western boundary currents play in biogeochemical cycles and marine ecosystems?
- What processes are important?
- How variability and change of the western boundary current influence the biogeochemical cycles and marine ecosystems?

PICES will support an additional PICES member to give a presentation at the joint session. Dr. Minobe commented that an IMBER-type researcher would fit the theme of the session, because motivation for collaboration between PICES and the CLIVAR Pacific Panel is based on future collaboration between CLIVAR and IMBER. If you are interested in participating in the session, please contact Dr. Minobe (minobe@mail.sci.hokudai.ac.jp) in the next few weeks.

This will be the 2nd International Symposium on “*Boundary Current dynamics*”, following the first one held May 31–June 2, 2010, in Qingdao, China. The objectives of the Symposium can be found at <http://www3.ouc.edu.cn/gjhy/index.aspx>. The agenda of the 1st Symposium is included below.

Title: International Symposium on “Boundary Current Dynamics: Its connection with open-ocean and coastal processes and responses to global climate change”

Draft Agenda

Date: 05/31-06/02, 2010

Venue: Meeting Hall in Huanghai Hotel, Qingdao, China

 Day 1: May 31, 2010 (Monday)

Chaired by Lixin Wu

08:20~08:30 Prof. Dexing Wu (President of Ocean University of China): Welcome speech

08:30~08:40 Prof. Martin Visbeck: Speech on behalf of CLIVAR

Session 1: Boundary Current and Climate

Chaired by Shang-Ping Xie

08:40~09:00 Terrence Joyce (Woods Hole Oceanographic Institution) On the path of the Gulf Stream and the Atlantic Meridional Overturning Circulation.

09:00~09:20 Martin Visbeck (IFM-GEOMAR) Observing Western Boundary Current Transport and Property Variability in the Atlantic Sector from the Subpolar Gyre to the tropical South Atlantic.

09:20~09:40 R. Saravanann (Texas A&M University) Modeling the Influence of the Atlantic Meridional Overturning Circulation on Tropical Atlantic Climate.

09:40~10:00 Zhengyu Liu (University of Wisconsin-Madison) Testing thermohaline stability during deglaciation.

10:00~10:20 Ping Chang (Texas A&M University) A High-Resolution Coupled Regional Climate Model Study of Frontal-Mesoscale Air-Sea Interactions along the Gulf Stream.

10:20~10:40 Coffee break

Session 1: Boundary Current and Climate (continued)

Chaired by Zhengyu Liu

10:40~11:00 Walt Robinson (North Carolina State University) On the Influence of Anomalous Ocean Temperatures on the Large-scale Atmospheric Flow.

11:00~11:20 Niklas Schneider (University of Hawaii at Manoa) The impact of SST on the atmospheric Ekman pumping.

11:20~11:40 Hisashi Nakamura (University of Tokyo) Influence of mid-latitude oceanic frontal zones on the formation of storm-tracks and westerly jets and on their annular variability.

11:40~11:55 Xiaopei Lin (Ocean University of China) Millennial-scale climate changes in the western Pacific- Possible Role of the Kuroshio.

11:55~13:30 Lunch

Session 1: Boundary Current and Climate (continued)

Chaired by Chunzai Wang

13:30~13:50 Claude Frankignoul (Université Pierre et Marie Curie) Influence of the Meridional Shifts of the Kuroshio and the Oyashio Extensions on the Atmospheric Circulation.

13:50~14:10 Shoshiro Minobe (Hokkaido University) Influence of the Kuroshio in the East China Sea on the troposphere.

14:10~14:30 Masami Nonaka (Japan Agency for Marine-Earth Science and Technology)

Decadal variations in heat content and surface heat flux in the western North Pacific in a coupled GCM.

14:30~14:45 Jiaxu Zhang (University of Wisconsin-Madison) Kuroshio Extension variability during the last 50 years and its predictability.

14:45~15:00 Coffee break

Session 1: Boundary Current and Climate (continued)

Chaired by Jiayan Yang

15:00~15:20 Stephen Riser (University of Washington) Large-Scale Meridional Transport in the Pacific and the Inference of Western Boundary Current Transports.

15:20~15:40 Dunxin Hu (Institute of Oceanology, Chinese Academy of Sciences) Seasonal to Interdecadal Variability of the NEC-MC-Kuroshio System.

15:40~16:00 Bo Qiu (University of Hawaii at Manoa) Multi-scale Circulation Variability in the Low-Latitude Western North Pacific Ocean.

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- 16:00~16:20 Yuji Kashino (Japan Agency for Marine-Earth Science and Technology) Observations of the Pacific Low-latitude Western Boundary Currents.
- 16:20~16:40 David Harper (NASA) Potential opportunities for research analyses with satellite observations.
- 16:40~16:55 Yongqiang Yu (Institute of Atmospheric Physics, Chinese Academy of Sciences) A preliminary result of a high resolution Pacific-Indian basin-wide ocean general circulation model.
- 16:55~17:10 Faming Wang (Institute of Oceanology, Chinese Academy of Sciences) Interactions between Mesoscale SSH Features in the Western Tropical Pacific.
- 17:10~18:30 Poster session
- 18:30 Banquet

Day 2: June 1, 2010 (Tuesday)

Session 2: Tropical Climate Dynamics
Chaired by Ping Chang

- 08:20~08:40 Michael Alexander (NOAA Earth System Research Laboratory) ENSO's Influence on the Gap Winds Through the Central America Mountains and the Eastern Tropical Pacific Ocean.
- 08:40~09:00 Wenju Cai (CSIRO) Asymmetry in ENSO teleconnection with regional rainfall, its multi-decadal variability, and impact.
- 09:00~09:20 Mu Mu (Institute of Oceanology, Chinese Academy of Sciences) The error growth dynamics and spring predictability barrier of El Nino prediction.
- 09:20~09:40 Axel Timmermann (IPRC/University of Hawaii) Wind effects on past and future regional sea-level rise in the Indo-Pacific.
- 09:40~09:55 Fan Wang (Institute of Oceanology, Chinese Academy of Sciences) Interannual variability of the North Equatorial Current bifurcation and its relationship with ENSO cycle.
- 09:55~10:10 Dongliang Yuan (Institute of Oceanology, Chinese Academy of Sciences) Interannual horizontal heat advection in the surface mixed layer over the equatorial Pacific Ocean: Assimilation versus TAO analysis.
- 10:10~10:30 Coffee break

Session 3: General Air-Sea Interaction Dynamics
Chaired by Wenju Cai

- 10:30~10:50 Shang-Ping Xie (University of Hawaii at Manoa) Large-scale patterns that emerge from global warming.
- 10:50~11:10 Chunzai Wang (NOAA Atlantic Oceanographic and Meteorological Laboratory) Climate and Hurricane Variability.
- 11:10~11:25 Fangli Qiao (The first Institute Oceanography, State Oceanic Administration) The non-breaking surface wave induced vertical mixing and its effects in climate system.
- 11:25~11:40 Ge Chen (Ocean University of China) Climate Related Natural Modes in Sea Level and Sea Surface Temperature Variability.
- 11:40~11:55 Changlong Guan (Ocean University of China) The Proposed Parametrizations of Air-Sea Momentum and Heat Transfer Applicable to From Low to Extreme Winds.
- 11:55~13:30 Lunch

Session 4: Boundary Current and Marginal Sea Dynamics
Chaired by Bo Qiu

- 13:30~13:50 Robert Weisberg (University of South Florida) West Florida Continental Shelf Circulation from Sustained Observations.
- 13:50~14:10 Michael Spall (Woods Hole Oceanographic Institution) On the heat transport and overturning circulation in marginal seas.
- 14:10~14:30 Jiayan Yang (Woods Hole Oceanographic Institution) WBC Interactions with Marginal and Shelf Seas.
- 14:30~14:45 Qinyu Liu (Ocean University of China) Coherence and Difference of Sea Surface Height and Temperature interannual variability in the South China Sea.
- 14:45~15:00 Shin Kida (Japan Agency for Marine-Earth Science and Technology) The impact of coastal currents on marginal sea outflows.

- 15:00~15:15 Magdalena Andres (Woods Hole Oceanographic Institution) Remote Forcing of the Kuroshio in the East China Sea: Transport Variability at Interannual-to-Decadal Time Scales.
- 15:15~15:30 Yuping Guan (South China Sea Institute of Oceanology, Chinese Academy of Sciences) Seasonal and Interannual Variability of the Kuroshio Anomalies in SST and Surface Heat Fluxes.
- 15:30~15:45 Coffee break

Session 4: Boundary Current and Marginal Sea Dynamics (continued)

Chaired by Qinyu Liu

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- 15:45~16:05 Lian Xie (North Carolina State University) Dynamic Downscaling of Global Climate Change Impacts on the Variability of the Coastal Ocean Circulation in Galapagos Marine Reserve from 1951 to 2050.
- 16:05~16:25 Toru Miyama (Japan Agency for Marine-Earth Science and Technology) Beyond Coastal vs. Large-Scale Oceanography: Scale Interaction Modeling of Kuroshio with JCOPE (Japan Coastal Ocean Predictability Experiment).
- 16:25~16:40 Jiwei Tian (Ocean University of China) The pathway of the Pacific deep water into the South China Sea through the Luzon Strait
- 16:40~16:55 Wei Liu (University of Wisconsin-Madison) Breaking of progressive internal waves.
- 16:55~17:10 Yan Du (South China Sea Institute of Oceanology, Chinese Academy of Sciences) Three inflow pathways of the Indonesian throughflow as seen from the Simple Ocean Data Assimilation.
- 17:10~18:30 Poster session
- 18:30 Dinner

Day 3: June 2, 2010 (Wednesday)

Session 5: Biophysical Processes in Coastal Margins

Chaired by Ruoying He

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- 08:20~08:40 Francisco Chavez (Monterey Bay Aquarium Research Institute) Biogeochemical and ecological response of eastern boundary currents to climate and global change.
- 08:40~09:00 Art Miller (Scripps Institution of Oceanography) Pacific Decadal Variability and Regional Impacts on Eastern Boundary Currents and the Ecosystem.
- 09:00~09:20 Fei Chai (University of Maine) Modeling impacts of mesoscale eddies on biogeochemical processes in the South China Sea.
- 09:20~09:40 R. Hetland (Texas A&M University) Transport and transformation of fresh water in river plumes, and shelf ecosystem impacts.
- 09:40~09:55 Jianyu Hu (Xiamen University) Statistical Analysis of Mesoscale Eddies in the South China Sea and the Western Pacific Ocean.
- 09:55~10:10 Wei Zhao (Ocean University of China) Observed abyssal flows in the Luzon Strait.
- 10:10~10:30 Coffee break

Session 5: Biophysical Processes in Coastal Margins

Chaired by Fei Chai

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- 10:30~10:50 Richard Dugdale (Romberg Tiburon Center) Workhorses Eastern Boundary upwelling systems: home of diatoms of the sea.
- 10:50~11:10 Ruoying He (North Carolina State University) Inter-annual Variability of Circulation and Biophysical Processes in the Northeastern U.S. Coastal Ocean.
- 11:10~11:25 Jun Cheng (Nanjing University of Information Science and Technology) On the mechanism of thermohaline overshooting at Bolling-Allerod.
- 11:25~11:40 Lixin Wu (Ocean University of China) Linking the Western Pacific-Asian Marginal Seas to Global Climate System.
- 11:40~11:50 Lixin Wu: Closing remark
- 11:50~13:30 Lunch
- 13:30~18:30: City tour, gathered in the Hall of Huanghai Hotel

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Poster:

- Qingjia Meng (Institute of Oceanology, Chinese Academy of Sciences) Did the Walker Circulation Weaken during the 20th Century?
- Xiangzhou Song (Ocean University of China) Dominance of the global oceanic sensible heat flux anomaly during the recent three decadal.
- Haixia Shan (Lanzhou University) Variability of Typhoons Impacting Taiwan Island.
- Xiaoling Yu (Institute of Oceanology, Chinese Academy of Sciences) Sensitivity of Kuroshio meander state in a ROMS simulation to different magnitude of horizontal mixing coefficients.
- Yanke Tan (PLA University of Science and Technology) Simultaneous Relationship between Abnormal Kuroshio Temperature Change and Rainfall Probability over China in Early Summer.
- Zhong Zhong (PLA University of Science and Technology) Propagation characteristics of atmospheric perturbations in response to the abnormal warmer SST in the Kuroshio Extension in winter.
- Yuanyuan Qu (The first Institute Oceanography, State Oceanic Administration) Dynamics response of shelf water in the East China Sea on the Strong shear of Kuroshio.
- Chun Hoe Chow (Ocean University of China) The Life Histories of the Dongsha Cyclonic Eddy and the Vietnam Cyclonic Eddy in the South China Sea.
- Jilin Sun (Ocean University of China) Affections of marginal heat anomaly on vicinity climate variation over continent.
- Hui Zhou (Institute of Oceanology, Chinese Academy of Sciences) Variations of the North Equatorial Current Bifurcation Induced by Mesoscale Eddies.
- Shan Gao (Institute of Oceanology, Chinese Academy of Sciences) Where does the water of Luzon undercurrent come from?
- Yousong Huang (Ocean University of China) Population genetic structure of the planktonic copepod *Calanus sinicus* in China Marginal Seas.
- Liangyong Zhou (Qingdao Institute of Marine Geology) Measuring Suspended Sediment Transport offshore North Jiangsu Province with Acoustic Doppler Current Profilers.
- Yonghong Wang (Ocean University of China) Variation on sedimentary environment changes during Holocene in the central South Yellow Sea: evidence from environmental magnetism.
- Ju Lin (Ocean University of China) Impact of Kuroshio intrusion on long-range underwater sound propagation in the Luzon Strait.
- Xiaomei Yan (Institute of Oceanology, Chinese Academy of Sciences) Streamwise Analysis of the Kuroshio Front in the East China Sea based on Remote Sensing Observations
- Yuanlong Li (Institute of Oceanology, Chinese Academy of Sciences) Intrusive Thermohaline Fine-structure near the Philippine coast.
- Xia Ju (The first Institute Oceanography, State Oceanic Administration) Heat Transport along Western Boundary of North Pacific in fall.
- Kaicheng Lu (PLA University of Science and Technology) Dynamic Statistic Analysis for Upper Abnormal Current of April in North Pacific
- Yongchui Zhang (PLA University of Science and Technology) Predictability of Sea Surface Height and Variability of Eddy Kinetic Energy.
- Peinan Zheng (Marine Environmental Ensuring Center) A Mechanism for the Bifurcation of the Tsushima Warm Current in the Japan/East Sea.
- Xiangfeng Meng (Ocean University of China) The response of Indonesian Throughflow (ITF) to ENSO events.
- Chao Ma (Ocean University of China) On the mechanism of Yellow Sea Warm Current and seasonal sea level variations in China coastal seas.
- Yun He (Ocean University of China) Comparison of Calculated Air-sea Fluxes by Vortex relation and Bulk Equations.
- Dedao Shi (Ocean University of China) Heat content variation in the eastern marginal seas and the local atmosphere-marginal sea interaction.
- Guojian Wang (Ocean University of China) The interannual adjustment of intraseasonal variability in the East Indian Ocean and its mechanism.
- Wenxia Zhang (Ocean University of China) The Interannual variability of the Mesoscale eddies in the southern ocean and its mechanism.
- Lei Zhang (Ocean University of China) Warm Pool and the Inter-annual, Decadal Variations of the Pacific Air-sea System.
- Yi Yu (Ocean University of China) The influence of MJO-related Kelvin waves on El Nino.
- Liping Zhang (Ocean University of China) Coupled Ocean-Atmosphere Response to Recent Freshwater Changes over the Kuroshio-Oyashio Extension Region.

Donghui Xu (Ocean University of China) Selective feeding of *Calanus sinicus* (Copepoda: Calanoida) on natural phytoplankton assemblage in the South Yellow Sea in summer.

Hongju Chen (Ocean University of China) Patterns in diversity and community structure of pelagic copepods in the Yellow Sea and East China Sea in autumn, 2007.

Zhaohui Chen (Ocean University of China) Dynamics of the seasonal cycle of the North Equatorial Current Bifurcation

POC Endnote 5

POC Committee Action Plan 2012

Mission

To promote and coordinate physical and geochemical oceanography, atmospheric science, and interdisciplinary research in the northern North Pacific. The impacts of climate variability and the physical dynamics in coastal, shelf and open ocean areas will be considered with emphasis on processes that relate to living marine resources and environmental quality.

Broad scientific issues that POC wants to address in the next five years are

- coordination of carbon-related issues in the North Pacific;
- improved understanding of climate variability and change and the provision and assessment of regional climate projections in the North Pacific

Key scientific questions, issues, or topics that POC plans to address in the next five years are

- What are the pivotal mechanisms of North Pacific climate variability and change that are linked to and required to predict changes in marine ecosystems of the North Pacific?
- What are the major circulation and physical/geochemical changes that the latest basin-wide and regional climate change models foresee for the North Pacific and its marginal seas?
- Providing a summary of these changes in a manner that will be useful to other PICES committees and groups.

Strategy of the POC Committee

In executing its mission, POC will address each of the five central themes of PICES: (A) Advancing scientific knowledge; (B) Applying scientific knowledge; (C) Fostering partnerships; (D) Developing capacity; and (E) Ensuring a progressive organization. Specific goals within each of these themes are as follows.

Theme A. *Advancing scientific knowledge*

Goal 1. Understand the functioning, resilience, and vulnerability of marine ecosystems

Action 1.1 At upcoming PICES meetings, convene sessions and workshops to address important physical and chemical processes that underlie the structure and function of marine ecosystems.

Task 1.1.1 Continue to support Working Group 27 on *North Pacific Climate Variability and Change*

Task 1.1.2 Convene topic session(s) and workshop(s) at PICES annual and inter-sessional meetings related to activities of Working Group 27.

Task 1.1.3 Facilitate future workshops of POC subsidiary groups such as the CREAMS Advisory Panel, Section on *Climate Change Effects on Marine Ecosystems*, and Section on Carbon and Climate.

Task 1.1.4 Convene a POC paper session at all PICES annual meetings.

Task 1.1.5 Continue to convene workshops and summer schools as proposed by AP-CREAMS and other POC subsidiary groups.

Goal 2. Understand and quantify how marine ecosystems respond to human activities and natural forcing

Action 2.1 Assess the regional climate projections focusing on but not limited to the North Pacific and their impact on marine ecosystems in collaboration with other committees and expert groups.

- Task 2.1.1 Continue to support Working Group 29, “Regional Climate Modeling”.
- Task 2.1.2 Convene topic session(s) and workshop(s) at PICES annual and inter-sessional meetings related to activities of Working Group 29
- Task 2.1.3 Analyze CMIP5 climate projections.

Theme B. *Applying scientific knowledge*

Goal 3. Provide scientific advice pertinent to North Pacific ecosystems

Action 3.1 Provide necessary information for FUTURE Implementation Strategy

- Task 3.1.1 Provide the PICES Science Board and its subsidiary groups with information about physical forcing and its climate modulation necessary for PICES actions regarding North Pacific ecosystems.

Goal 4. Ensure that PICES products are relevant, timely, and broadly accessible.

Action 4.1 Publish reports and workshop proceedings from POC subsidiary groups.

- Task 4.1.1 Provide “Outlooks” of the North Pacific physical and chemical changes in conjunction with other PICES expert groups
- Task 4.1.2 Publish final reports from the climate working groups.
- Task 4.1.3 Publish a report and/or review paper on best practices for regional coupled modeling.
- Task 4.1.3 Publish comprehensive research works in the Yellow Sea and the East China Sea from CREAMS advisory panel.
- Task 4.1.4 Publish reports arising from S-CC data synthesis and other activities.

Theme C. *Fostering partnerships*

Goal 5. Collaborate with organizations and scientific programs relevant to PICES

Action 5.1 Collaborate with organizations with goals related to POC committee and its subsidiary groups.

- Task 5.1.1 Coordinate North Pacific CO₂ issues through the CC-S section with international projects such as CLIVAR, IMBER, SOLAS, and GEOTRACES.
- Task 5.1.2 Continue support for PICES-CREAMS advisory panel & S-CCME
- Task 5.1.3 Continue support for NEAR-GOOS and the GOOS Regional Alliances Networking Development (GRAND) project.
- Task 5.1.4 Continue support for capacity building programs convened by subsidiary groups.
- Task 5.1.5 Collaborate with CLIVAR and other international programs on the new climate working groups.
- Task 5.1.6 Continue working relationship with the Pacific Coastal Ocean Observing System (www.pacoos.org).

Goal 6. Strengthen communication and engagement with users of PICES scientific products

Action 6.1 Characterize North Pacific climate variability and change and their future outlooks, and communicate their possible impacts on marine ecosystems.

- Task 6.1.1 Participate actively in PICES's public outreach activities in disseminating products.
- Task 6.1.2 Establish web pages for participating in working group activities.

Theme D. Develop capacity

Goal 7. Advance methods and tools to improve and enhance scientific activities

- Action 7.1 Provide lessons learned from regional ocean climate projections.
 - Task 7.1.1 Publish reports and/or review papers on the best practices in regional climate modeling.
 - Task 7.1.2 Provide the requirements for regional ecosystem modeling studies.

Goal 8. Foster collaboration among scientists within PICES

- Action 8.1 Encourage active participation from all PICES countries in the POC committee and its subsidiary groups.
 - Task 8.1.1 Include participants from all PICES nations in new climate working groups and subsidiary groups.
- Action 8.2 Encourage communication with subsidiary groups and other committees.
 - Task 8.2.1 Convene joint sessions and workshops with other committees at PICES annual meetings.

Goal 9. Create education and training opportunities

- Action 9.1 Participate actively in developing PICES training courses
 - Task 9.1.1 Support 2013 (and subsequent) PICES summer school(s) by participating as organizing committee members.

Theme E. Ensure a progressive organization

Goal 10. Provide an effective infrastructure to support PICES activities

- Action 10.1 Ensure POC activities to be delivered to SB & other PICES community in a timely and effective fashion.
 - Task 10.1.1 Report scientific activities through annual and inter-sessional topic sessions and workshops in a timely fashion.
 - Task 8.1.3 Where possible, include electronic manuscripts (or links) arising from PICES/POC collaborations on PICES web page.

POC Endnote 6

Proposals for Paper and Topic Sessions at PICES-2013

1-day POC Paper Session

Papers are invited on all aspects of physical oceanography and climate in the North Pacific and its marginal seas

Co-conveners: Kyung-Il Chang (Korea) and Michael Foreman (Canada)

Ranked POC co-sponsoring Topic Sessions for PICES-2013

1. 1-day BIO/POC/TCODE/ MONITOR/FUTURE Topic Session on “Recent trends and future projections of North Pacific climate and ecosystems” (WG 29 Endnote 5);
2. 1-day POC Topic Session (co-sponsored by SOLAS) on “The changing carbon cycle of North Pacific continental shelves and marginal seas” (S-CC Endnote 3);
3. (½-day BIO/FIS/POC Topic Session) on “Are marine ecosystems of the North Pacific becoming more variable?” (AP-MBM Endnote 6);
4. 1-day MONITOR Topic Session on “Cost-effective, cooperative ocean monitoring” (MONITOR Endnote 3);
5. (1-day FIS/FUTURE Topic Session) on “Science needs for offshore oil and gas development in the North Pacific” (FIS Endnote 3);
6. 1-day FIS/TCODE Topic Session (co-sponsored by ISC) on “Banking on recruitment curves; returns on intellectual investment” (FIS Endnote 3).

POC Endnote 7

POC-supported workshops for PICES-2013

1. 1-day Workshop on “Comparison of size-based and species based ecosystem models”

Size-based and species-specific ecosystem models are two different approaches to ecosystem modeling, based on different assumptions and designed to address somewhat different questions. In recent years considerable development of size-based models has occurred within the ICES community while the PICES community has typically focused on species-specific models for its applications. The objective of this workshop is to bring together the two communities of modelers to: (1) advance our understanding of the advantages and limitations of these two modeling approaches, especially in the context of modeling climate impacts on ecosystems, (2) make direct comparisons of the predictions of ecosystem structure and dynamics, both top-down and bottom-up, from both these model types applied to the same regional ecosystem, where possible under climate change forcing, and (3) discuss the benefits and feasibility of developing hybrid size-based and species-specific models. The workshop will be structured with a series of talks to kick off discussion on these 3 topics.

Co-convenors: Jeffrey Polovina (USA), Anne Hollowed (USA), Shin-ichi Ito (Japan) and Myron Peck (Germany)

Co-sponsor: ICES

Invited speakers: Julia Blanchard (UK), Villy Christensen (Canada)

2. 1-day Workshop on “Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for the future”

Climate variability and change in the ocean is now recognized as a significant driver of marine ecosystem response, from primary production to zooplankton composition, and through the trophic chain to fish, marine mammals and other top predators. Past studies have often relied upon existing datasets to draw correlative conclusions (associated with indices and discovered time-lags in the system) regarding the possible mechanisms that may control these linkages. In this workshop, we seek to identify and model key processes that enable us to succinctly and quantifiably explain the mechanisms underlying the correlative relationships in physical-biological datasets, both in the North Pacific and North Atlantic. The description and modeling of these key processes may (a) involve few or several variables (but not full complexity), (b) use dynamical (e.g., eddy-resolving ocean models, NPZ, IBM, etc.) or statistically based methods (e.g., Bayesian, linear inverse models, etc.), (c) explain variability in low or high trophic levels (although we seek to emphasize secondary and higher producers), and (d) include uncertainty estimation. We also solicit ideas and hypotheses concerning new mechanisms of physical-biological linkages that can only be tested by establishing novel long-term observational strategies, where the harvest of understanding will eventually be reaped by future generations of

ocean scientists, as well as by developing creative modeling datasets, where ecosystem complexities can be effectively unraveled. The workshop format will be a mixture of talks and group discussions that aim at enriching the exchange of ideas and concepts between physical and biological ocean scientists. The ultimate goal is to deliver: (1) a set of new hypotheses of the mechanisms of marine ecosystem response to climate forcing, and (2) a description of the observational and modeling datasets required to test these hypotheses using process models.

Sponsoring Committees/Program: POC, BIO, MONITOR, FUTURE

Co-conveners: Emanuele Di Lorenzo (USA), Marc Hufnagl (Germany), Jacquelynne King (Canada), Arthur Miller (USA), Shoshiro Minobe (Japan), Ryan Rykaczewski (USA) and Kazuaki Tadakoro (Japan)

Co-sponsor: ICES

Invited speakers: Jürgen Alheit (Germany), Carolina Parada (Chile)

POC Endnote 8

POC-supported capacity building programs

2013 PICES Summer School (supported by Science Board; approved by Council in 2011)

Topic: Ocean Observing Systems and Ecosystem Monitoring

Date and venue: August 18–23, Newport, Oregon, USA

It will consist of lectures, lab. activities, and field works.

Students: ~25 graduate students and possibly early career scientists

Instructors: 8

Application deadline: February 1, 2013.

Principal organizer/Steering-Selection Committee: Dr. Jack Barth/8 from committees (3 from POC; Drs. Kyung-Il Chang, Shin-ichi Ito, and Steven Bograd)

Possible external funding: Nippon Science Foundation, APN, NOWPAP, other individual research funds

Proposal for 2014 PICES Summer School (submitted by AP-CREAMS)

Topic: Ecological Modeling

Purpose: Ecological models have applications in a wide variety of disciplines, such as natural resource management, wildlife conservation and agriculture. These models are formed by combining known complicated ecological relations with field observation data, and are being used to provide an understanding about the important processes in ecosystems and predictions about the changing ecosystem dynamics. The purpose of this Summer School is to review and present methods of modeling in ecological relations, and to show how these models (methods) can be applied to understand and predict ecosystem changes.

Date: August 18-21, 2014

Venue: Seoul National University, Korea

Students: maximum ~ 30

Lecturers: up to 10 (including 5 foreign lecturers)

Organizing committee: to be determined

Request for financial support from PICES: travel costs for 5 non-Korean students and two foreign lecturers

The Technical Committee on Data Exchange

The meeting of the Technical Committee on *Data Exchange* (hereafter TCODE) was held from 18:00 to 19:30 h on October 14 and from 14:00 to 18:00 h on October 17, 2012, in Hiroshima, Japan. Four members were replaced since the last TCODE meeting in 2011 with Mr. Graham E. Gillespie from Canada, Mr. Jinkun Yang from China and Dr. Joon-Soo Lee from Korea, (*TCODE Endnote 1*). Mr. Robin Brown, the first chairman of TCODE, noted that Dr. Tom Royer (USA), a founding member of TCODE, had resigned in April 2012, and took special notice of his service to TCODE. Ms. Lynn deWitt (USA) replaces him. Dr. Tony Koslow was appointed rapporteur by TCODE Chairman, Dr. Toru Suzuki. Several changes were made to the draft agenda. The revised agenda was adopted (*TCODE Endnote 2*).

AGENDA ITEM 3

Status of Topic Session “*Changing ocean biogeochemistry and its ecosystem impacts*” (S14)

Dr. Suzuki explained the background of the TCODE co-sponsored Topic Session (S14) and Dr. Koslow, Co-convenor of S14, discussed its status. He was also designated as the primary correspondent Co-convenor to prepare a session summary report and to summarize the scores of TCODE Best Oral/Poster Presentation provided by the other Co-convenors.

AGENDA ITEM 4

Review of procedure for Best Oral Presentation and Best Poster Presentation

Dr. Suzuki explained that TCODE could choose a Best Oral Presentation between two early career scientists and a Best Poster Presentation among 4 of 6 posters (one was cancelled and one declined) in S14. Dr. Suzuki also recommended using a score sheet to facilitate evaluation for the awards.

AGENDA ITEM 5

Status of proposed topic sessions/workshops of PICES-2013

Dr. Suzuki noted that 13 topic sessions and 7 workshops were submitted through a new on-line procedure of sessions/workshops proposals. TCODE members discussed a workshop proposed by Ms. Lynn deWitt, one of new members of TCODE. Mr. Robin Brown pointed out that the workshop was too narrowly scoped, and suggested a new and broader title and the addition of co-convenors from western Pacific. TCODE decided to support the workshop if Ms. deWitt and co-proposers would accept those suggestions and Dr. Suzuki promised to contact Ms. deWitt by email. TCODE also decided to recommend three topic sessions based on the ranks assigned by TCODE members to each proposal.

AGENDA ITEM 6

Status of upcoming inter-sessional workshops/symposia

Dr. Suzuki announced that a FUTURE inter-sessional workshop will be held on May 22–24, 2013, in western Russia and a FUTURE Open Science Meeting will take place in April 2014 in Honolulu or Kona, HI, USA.

AGENDA ITEM 7

Report of POMA 2012

Dr. Suzuki reported on the selection of POMA 2012 at the inter-sessional Science Board meeting in May 2012, Busan, Korea. He encouraged the members to submit new nomination(s) for POMA because just two nominations remain, rolled over to the present.

TCODE-2012

AGENDA ITEM 8

Status of FUTURE

Mr. Brown, Chairman of FUTURE's AP-SOFE, discussed the status of FUTURE and a draft FUTURE roadmap which was presented at the FUTURE joint Advisory Panel meeting, October 14. Members identified two TCODE outreach activities in 2012–2014: the update of FUTURE Wikipedia and a climate index portal. Dr. Igor Shevchenko agreed to update FUTURE Wikipedia continuously. Dr. Phil Mundy, Vice-Chairman of MONITOR, was welcomed to the meeting and he explained that a climate index portal is required for North Pacific Ecosystem Status Report III and is related to the achievements of Working Group on *North Pacific Climate Variability and Change* (WG 27). TCODE agreed to support the establishment of the portal. TCODE also agreed to support the establishment of an interactive website which was requested by the Section on *Climate Change Effects on Marine Ecosystems*, using Google sites. Mr. Brown will retire as Chairman of AP-SOFE but intends to remain a member. Drs. Shevchenko and Suzuki also confirmed to remain as members of AP-AICE and AP-COVE, respectively.

AGENDA ITEM 9

Review progress of TCODE workplan for 2011/2012

For a further breakdown of activities, see *TCODE Endnote 3*.

1. Continue to support, coordinate, and identify of PICES data and information products.

On behalf of AP-COVE, Dr. Suzuki reported that the Section on Carbon and Climate (S-CC) has almost completed PACIFICA (Pacific Ocean Interior Carbon) data synthesis project but several updates were required. S-CC maintains relations with international programmes/projects such as SOCAT, SOLAS/IMBER, IOCCP, GLODAPv2, CLIVAR/GO-SHIP and IPCC. For AP-SOFE, Mr. Brown noted that expert groups were making good progress.

2. Cooperation with other data management groups and activities.

Dr. Georgiy Moiseenko reported that ICES WGDIM (Working Group on Data and Information Management) was renamed to DIG (Data and Information Group). Dr. Suzuki announced that the IODE GE-BICH workshop was postponed to October 22–24 and he will attend the workshop in Oostende, Belgium, just after the PICES Annual Meeting, and that IODE SG-ODP II was changed to a Technical Workshop of ODP (Ocean Data Portal) and will also be held in Oostende, February 27–29, 2012, where he will discuss the status and future plans of ODP.

3. PICES Metadata Federation Project

Dr. Schevchenko proposed to renew to the cloud server which was the same cost as the present rented server. He also expressed his willingness to continue to administer server and noted that he has a poster presentation about the TCODE GeoSpatial Portal at PICES-2012. Dr. Suzuki remarked that any new record not yet registered to GeoSpatial Portal could still be registered next year. Dr. Schevchenko expressed his willingness to continue to update the Technical Report of the GeoSpatial Portal to promote the use of the Portal.

4. Maintain TCODE web page.

Dr. Schevchenko expressed his willingness to maintain the TCODE web page continuously.

5. PICES-2012 Topic Session and Best Oral/Poster Presentation.

Dr. Koslow reported that the TCODE co-sponsored Topic Session S14 finished successfully. He also informed members that the Co-conveners' decision for Best Oral/Poster Presentation will be decided at the end of the poster session on Thursday evening, October 18.

6. Topic session and/or workshop proposals to PICES-2013 in Nanaimo, Canada.

As discussed in Agenda Item 5, Dr. Suzuki reported that Ms. deWitt accepted TCODE's suggestion to nominate three potential invited speakers; Dr. Suzuki also expressed his willingness to act as co-convenor representing of western side of the Pacific.

7. POMA 2012 nomination.

As discussed at Agenda Item 7, Dr. Suzuki already reported the results of POMA 2012 and TCODE members were encouraged to submit new nominations for POMA 2013 because the pool of two nominations, carried over from past year(s), was very small.

8. Prepare to register metadata of WG 21 database.

Dr. Deborah Reusser, a member of Working Group on Non-indigenous Aquatic Species (WG 21), participated in the meeting and informed TCODE that metadata for WG 21's database is ready. Dr. Shevchenko reported that he is still preparing registration of those metadata and will continue this activity into the next year.

9. Prepare to produce the North Pacific Ecosystem Status Report – third edition.

As discussed at Agenda Item 8, TCODE members confirmed their responsibility to prepare a climate index portal.

AGENDA ITEM 10

Review of TCODE Action Plan 2012–2015

Dr. Suzuki showed a draft TCODE Action Plan 2012–2015 which had been already circulated in TCODE members by email. It was pointed out that Actions 3.1 and 10.1 should be replaced with preparing North Pacific Ecosystem Status Report. Dr. Suzuki will present the Action Plan at the Science Board meeting after several minor changes have been made (*TCODE Endnote 4*).

AGENDA ITEM 11

Discussion and adoption of TCODE workplan for 2012/2013

Dr. Suzuki explained a draft TCODE workplan for 2012/2013 (*TCODE Endnote 3*) was reconstructed according to the TCODE Action Plan. In addition, Mr. Jinkun Yang expressed his willingness to support and report on activities of ODINWESTPAC and Dr. Joon-Soo Lee expressed Korea's support to establish an IODE ODP node in Korea.

AGENDA ITEM 12

Relation with specific international programs/organizations

TCODE members reviewed the list of proposed theme sessions of interest to TCODE for PICES co-sponsorship at the ICES 2013 ASC. A number of members recommended a session titled "*Observation and monitoring needs to support Ecosystem Based Management – preparing to serve the current of data coming upon us*" which Dr. Suzuki will recommend to Science Board.

Prior to introducing Dr. Ward Appeltans, project manager of OBIS (Ocean Biogeographic Information System) and IODE ODP, Dr. Suzuki related that representatives of ICES, IOC and SCOR had also made presentations about cooperation with PICES at the Science Board meeting on October 14. Dr. Appeltans participated through WebEx (www.webex.com) at the IOC project office for IODE, Oostende, Belgium, and presented a summary of OBIS and ODP activities and encouraged TCODE to work with IODE and contribute to OBIS from PICES member countries.

AGENDA ITEM 13

National Reports

Country reports from China, Korea and the U.S. can be found in *TCODE Endnotes 5, 6 and 7*, respectively.

TCODE-2012

AGENDA ITEM 14

Other business

Dr. Suzuki presented a proposal from Study Group on *Marine Pollutants* for a workshop at PICES-2013. TCODE members pointed out that the scope of the workshop was too narrow and target area was also limited. He will submit TCODE's comments at the Science Board meeting.

AGENDA ITEM 15

Closing

The meeting was closed at 18:00 h.

TCODE Endnote 1

TCODE participation list

Members

Robin Brown (Canada)
Graham Gillespie (Canada)
Tony Koslow (USA)
Joon-Soo Lee (Korea)
Georgiy Moiseenko (Russia)
Igor Shevchenko (Russia)
Toru Suzuki (Japan, Chairman)
Tomowo Watanabe (Japan)
Jinkun Yang (China)

Observers

Ward Appeltans (Belgium)
Phillip Mundy (USA)
Deborah Reusser (USA)
Natalia Rudykh (Russia)

TCODE Endnote 2

TCODE meeting agenda

Day 1: 18:00–19:30 Sunday, October 14 (JST)

1. Welcome and introduction of members
2. Adoption of agenda
3. Status of Topic Session “*Changing ocean biogeochemistry and its ecosystem impacts*” (S14) on October 16 (Koslow)
4. Review of procedure for Best Oral Presentation and Best Poster Presentation (Suzuki)
5. Status of proposed topic sessions/workshops of PICES-2013, Nanaimo (Suzuki)
6. Status of upcoming inter-sessional workshops/symposia (Suzuki)
7. Report of POMA 2012 (Suzuki)

Day 2: 14:00–18:00 Wednesday, October 17 (JST)

8. Status of FUTURE (Suzuki, Brown, Shevchenko)
9. Review progress of TCODE workplan for 2011/2012 (All)
10. Review of TCODE Action Plan 2012–2015 (Suzuki)
11. Discussion and adoption on TCODE workplan for 2012/2013 (All)
12. Relation with specific international programs/organizations
 - i. Review of ICES 2013 TS
 - ii. SCOR
 - iii. IOC and WESTPAC
 - iv. IODE OBIS/ODP (Dr Ward Appeltans through WebEx)

13. Country reports (representative of member countries)
14. Other business
 - i. Proposals from SG-MP
15. Closing

TCODE Endnote 3

TCODE workplan 2011/2012

1. Continue to support, coordinate, and identify of PICES data and information products
 - a) MONITOR – T. Royer
 - b) AP-AICE- (S-HAB, WGs 21 (–2012), 24) – I. Shevchenko and R. Brown (S-HAB)?
 - c) AP-COVE (S-CC, WGs 23 (–2011), 26, 27, 28) – T. Suzuki
 - d) AP-SOFE (WG-FCCIFS, SG-HD (–2011)) – R. Brown
 - e) AP-CREAMS/CRP/MBM (–2011) – T. Suzuki
2. Cooperation with other data management groups and activities
 - a) ICES WG on Data and Information Management (WGDIM) – G. Moiseenko
 - b) IODE GE-BICH workshop in March 2012 – H. Garcia and T. Suzuki
 - c) IODE SG-ODP-II in February 2012 – T. Suzuki
 - d) OBIS and invitation of *ex-officio* member – T. Suzuki
3. PICES Metadata Federation Project
 - a) Renew remote server contract – I. Shevchenko
 - b) Continue to administer AdHost server – I. Shevchenko
 - c) Prepare proposal to renew rented server for another year – I. Shevchenko
 - d) Develop strategy to award and encourage metadata submission – All
 - e) Run the AdHost server performance experiment on accessing metadata from different locations and multiple users – I. Shevchenko and all
 - f) Japan and Korea move their metadata records to the AdHost server – T. Suzuki (Japan)?, (Korea), I. Shevchenko
 - g) Promote the GeoNetwork Portal
 - i. Update the Technical Report to reflect GeoNetwork – I. Shevchenko, H, Garcia, R. Brown
4. Maintain TCODE web pages – I. Shevchenko
5. PICES-2012 Topic Session and Best Oral/Poster Presentation – T. Koslow (co-convenors)
6. Topic session and/or workshop proposals to PICES-2013 in Nanaimo, Canada – All
7. POMA 2012 nomination
 Remaining two nominations below will be rolled over to the next year (and beyond) for consideration at the next inter-sessional Science Board meeting.
 Consider a recommendation of new nomination before February 2012. Rank nominations for POMA 2012 before April 2012
8. Prepare to register metadata of WG 21 database. – I. Shevchenko
9. Prepare to produce the North Pacific Ecosystem Status Report – third edition. – T. Royer and R. Brown

TCODE Endnote 4

Technical Committee on Data Exchange Action Plan in 2012–2015

Mission

The missions of the PICES Technical Committee on Data Exchange (TCODE) are as follows:

- Identify the data management requirements of PICES;
- Development strategic plans to meet these requirements;
- Recommended establishment of ad hoc task groups to deal with specific functions of TCODE;
- Review the progress of task groups and provide Annual Reports to Science Board on the work of TCODE; and
- Advise the PICES Secretariat on its data exchange activities.

Strategy

To implement the mission, TCODE will develop three-year Action Plan each of goals of five central themes of PICES strategy: (A) Advance scientific knowledge; (B) Apply scientific knowledge; (C) Foster partnerships; (D) Develop capacity; (E) Ensure a progressive organization. Specific actions and tasks are identified within each of these themes as explained below.

Theme A. *Advance scientific knowledge*

Goal 1. *Understand the functioning, resilience, and vulnerability of marine ecosystems*

Action 1.1 Propose and support topic session and workshop

Task 1.1.1 Propose and support topic session and workshop at upcoming PICES annual meeting.

Goal 2. *Understand and quantify how marine ecosystems respond to human activities and natural forcing*

Action 2.1 Propose and support topic session and workshop

Task 2.1.1 Co-convene topic session at PICES 2012 annual meeting on “Changing ocean biogeochemistry and its ecosystem impacts”.

Task 2.1.2 Propose and support topic session and workshop at upcoming PICES annual meeting.

Theme B. *Apply scientific knowledge*

Goal 3. *Provide scientific advice pertinent to North Pacific ecosystems*

Action 3.1 Preparing the North Pacific Ecosystem Status Report.

Goal 4. *Ensure that PICES products are relevant, timely, and broadly accessible*

Action 4.1 Support and promote to use of shared information technologies.

Task 4.1.1 Maintain and promote to use of the PICES TCODE GeoSpatial Portal and their resource.

Theme C. Foster partnerships**Goal 5. Collaborate with organizations and scientific programs relevant to PICES**

- Action 5.1 Establish dialogue with the various bodies of the international, national, state and local organizations, commissions and programs involved into Marine Data Management issues.
- Task 5.1.1 Maintain a dialogue with the ICES Data and Information Group (DIC).
 - Task 5.1.2 Maintain a dialogue with the IODE of the IOC of UNESCO and its programme such as IODE Groups of Experts, OBIS (Ocean Biogeographic Information System), ODP (Ocean Data Portal) and ODINWESTPAC (Ocean Data and Information Networks in Western Pacific region).
 - Task 5.1.3 Support S-HAB work with the ICES-IOC Harmful Algal Event Database (HAEDAT) database and required metadata.
 - Task 5.1.4 Support S-CC work with the IOCCP and international scientific projects

Goal 6. Strengthen communication and engagement with users of PICES scientific products

- Action 6.1 Support and promote to use of shared information technologies.
- Task 6.1.1 Maintain and promote to use of the PICES TCODE GeoSpatial Portal and their resources.
 - Task 6.1.2 Support to register metadata of database of WG 21 on *Non-indigenous Aquatic Species* into PICES TCODE GeoSpatial Portal.
 - Task 6.1.3 Support to register metadata of products of WG-23 “Comparative ecology of Krill in coastal and oceanic waters around the Pacific Rim” into PICES TCODE GeoSpatial Portal.
 - Task 6.1.4 Support to register scientific products of PICES Scientific and Technical Committees and expert groups into GeoNetwork.
 - Task 6.1.5 Prepare to product of the North Pacific Ecosystem Status Report Third Edition.
 - Task 6.1.6 Promote to use of shared information tools such as Google Docs, Google Sites, *etc.*
 - Task 6.1.7 Promote PACIFICA database of S-CC

Theme D. Develop capacity**Goal 7. Advance methods and tools to improve and enhance scientific activities**

- Action 7.1 Provide support to use of shared information technologies.
- Task 7.1.1 Update and disseminate the Technical report of PICES TCODE GeoSpatial Portal.
- Action 7.2 Plan and convene topic session and workshop
- Task 7.2.1 Plan topic session and workshop at upcoming PICES annual meeting for marine data quality control/assurance and information exchange.

Goal 8. Foster collaboration among scientists within PICES

- Action 8.1 Promote and support to use of PICES TCODE GeoSpatial Portal.
- Task 8.1.1 Plan workshop or training course of registration data and information into PICES TCODE GeoSpatial Portal.

TCODE-2012

Goal 9. Create education and training opportunities

Action 9.1 Promote and support training and education activities of local, regional and international organizations.

Task 9.1.1 Promote and support training course and education of IOC, IODE, SOLAS, IMBER, IOCCP, ODINWESTPAC and other regional and international organizations and programme.

Theme E. *Ensure a progressive organization*

Goal 10. *Provide an effective infrastructure to support PICES activities*

Action 10.1 Preparing the North Pacific Ecosystem Status Report.

*TCODE Endnote 5***2012 Country report of China**

submitted by

Jinkun Yang, NMDIS/SOA

1. Working progress related to TCODE's "PICES Metadata Federation Project"

- i) The Chinese PICES-NMDIS node was registered on NSDI clearinghouse website through AdHost server. Considering the Agenda 6 of the 2011 TCODE meeting on the PICES Metadata Federation Project, "remove NPEM, KODC, MIRC servers from the NSDI clearinghouse site", China has decided to remove PICES-NMDIS node from NSDI clearinghouse site.
- ii) China agrees to move the metadata records of former PICES-NMDIS node to the AdHost server, to become one metadata source of the GeoNetwork portal. All the metadata records (see the table below for details) have already been submitted to the directory distributed for former PICES-NMDIS node (E:\site2\data\pices-nmdis-adhost) on the AdHost server.
- iii) China agrees to take part in the action of "Run the AdHost server performance experiment on accessing metadata from different locations and multiple users" and related work in the TCODE workplan for 2011/2012, to promote the development of PICES Metadata Federation Project.

Metadata	Station	Time period	No. of Records
Temperature and salinity data from Chinese coastal stations	Laohutan, Tanggu, Qinhuangd, Yantai, Haikou, Dongfang, Beihai, Lianyungang	1959–1976 1988–2001	8
Ocean tide forecasting product	32 major coastal ports in Southeast Asian coastal areas	Monthly	32
	10 major ports along Chinese coastal line, such as Dalian, Qingdao, Wusong, Zhenhai, Xiamen, Guangzhou, Beihai, Haikou, and Gaoxiong.	Monthly	10
Monthly mean sea level from Chinese oceanographic stations	Dalian, Kanmen, Lvsi, Zhapo, Nasha and Xisha.	2009–2010	6
Hourly sea level data from Chinese coastal stations	Lianyungang and Dalian	2008 and 2010	2
Meteorological, wave, temperature and salinity data from 13 Chinese coastal stations	Dalian, Xiaochangshan, Yantai, Xiaomaidao, Lianyungang, Lvsi, Shengshan, Zhenhai, Dachen, Nanji, Beishuang, Dongshan, and Zhelang	2010	13

2. Data exchange and cooperation with other related international or regional programs*2.1 Ocean Data and Information Network for the Western Pacific Region (ODINWESTPAC)*

Through the collection, exchange, and share the platform of marine data and information (ODINWESTPAC, hosted by NMDIS, website: <http://www.odinwestpac.org.cn/>), maintain and operationally update publicly released marine data and information of China and those collected from international programs/projects, to promote data and information exchange and collaboration between WESTPAC Member States, and with other international and regional data projects;

2.2 China NEAR-GOOS Delayed Mode Database

Maintain and update the China NEAR-GOOS Delayed Mode Database and its website (<http://near-goos.coi.gov.cn/>); timely release the real-time and delayed mode observation data from Russia, Japan, Korea, and China in Northeast Asia Region; provide basic data service for NEAR-GOOS and GOOS.

TCODE-2012

2.3 JCOMM CMOC China node on the trial basis

The proposal for the establishment of WMO-IOC Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs) was made at the Third Session of JCOMM ETMC (ETMC-III, Melbourne, Australia, February 8–12, 2010), and was approved at the Fourth Session of JCOMM (JCOMM-IV, Yeosu, Korea, May 23–31, 2012). CMOCs will endeavor to achieve the integrating collection, rescue, quality control, formatting, archiving, exchange, and access—for marine-meteorological and oceanographic real-time and delayed-mode data and associated metadata of known quality, and products that satisfy the needs of WMO and IOC applications. The National Marine Data and Information Service (NMDIS) of China has already submitted statements of capability and commitment to host CMOCs in Tianjin in February 2012. The Commission decided that China could begin filling the role of CMOCs on a trial basis immediately. Currently, the establishment work is actively on-going. The function of the former JCOMM ODAS Metadata Service will be incorporated in CMOC China.

2.4 IODE ODP China node

Maintain and update the metadata on the IODE ODP China node.

2.5 China GTSP Data Center

The China GTSP Data Center, established in 2007, is responsible for collecting, processing, managing and distributing the GTSP data. It maintains the operation of download, quality control, product R&D, and website release of Global GTSP data.

TCODE Endnote 7

2012 Country Report of of Korea

submitted by

Joon-Soo Lee, NFRDI

1. The Korea Oceanographic Data Center (KODC), which is operated by the National Fisheries Research and Development Institute (NFRDI), acts as a focal point for the assembly of oceanographic data and metadata in Korea.
2. The NFRDI/KODC produced and released the first version of a set of temperature and salinity climatological mean fields for the Oceanographic Atlas of the East Asian Seas (OAEAS) in cooperation with the NOAA/NODC (National Oceanic and Atmospheric Administration / National Oceanographic Data Center), USA. The user can view the temperature and salinity atlas with a horizontal resolution of 1°, 0.25°, 0.1° longitude/latitude grid or download the data from both NFRDI/KODC and NOAA/NODC web pages.
3. KODC has actively cooperated with the IOC/IODE (Intergovernmental Oceanographic Commission / International Oceanographic Data and Information Exchange) and supports the international exchange of oceanographic data and information. KODC is currently preparing to set up a national node of the IOC/IODE Ocean Data Portal.
4. Collected metadata in KODC are mainly reported in Korean, so it takes time to translate into English. KODC will continue to set up a metadata database and service.
5. To support TCODE activities, KODC will start to register the metadata to the PICES TCODE GeoSpatial Portal next year.

*TCODE Endnote 8***Country report of USA**

submitted by

Hernan Garcia, NOAA-NODC and Tony Koslow, Scripps Institution of Oceanography, UCSD

There is an ongoing and growing concern about how to enhance participation of PICES member states in unrestricted oceanographic and model data exchange and archiving. It is suggested that TCODE reach out to the PICES Science Board to help establish some formal mechanisms to enhance data exchange. Other options include *ad hoc* collaboration with international agencies such as the International Oceanographic Data and Information Exchange (IODE) of the Intergovernmental Oceanographic Commission (IOC) of UNESCO that runs the IODE Ocean Data Portal (IODE/ODP), for example.

Dr. Garcia and Dr. Suzuki will participate in the upcoming Second IODE Workshop on Quality Control of Chemical and Biological Oceanographic Data Collections (October 22–24, 2012, Oostende, Belgium)

Dr. Garcia communicated with PICES Executive Secretary, Dr. Alexander Bychkov, and Mr. Peter Pissierssens (Head of IOC Project Office for IODE) about having an *ex officio* representative of IODE during TCODE meetings to explore collaboration. Mr. Pissierssens advised that he could not attend at this time. Mr. Pissierssens suggested that Dr. Garcia and Dr. Suzuki represent IODE in this instance. He also suggested that Mr. Ward Appeltans (Project Manager, Ocean Biogeographic Information System (OBIS) and IODE Ocean Data Portal (IODE/ODP)) could present a short talk via webex.

The Technical Committee on Monitoring

The Technical Committee on Monitoring (MONITOR) met from 18:00–19:30 on October 14, and from 14:00–18:30 h on October 17, 2012, under the chairmanship of Dr. Hiroya Sugisaki. Nine Committee members were present, and a total of 18 scientists from 5 PICES member countries were in attendance (*MONITOR Endnote 1*). The meeting agenda (*MONITOR Endnote 2*) was very full and business was conducted at a brisk pace.

AGENDA ITEM 2

Reports of Advisory Panels

Advisory Panel on *Continuous Plankton Recorder Survey in the North Pacific* (AP-CPR) and recommendations

Dr. Phillip Mundy, AP-CPR Chair, reported on the Panel meeting held on October 13. AP-CREAMS recommended that MONITOR ask the Science Board to request the PICES Secretariat to send a letter of support to key U.S. supporters and allied agencies in March 2013 to heighten awareness of Continuous Plankton Recorder (CPR) project and PICES' continued involvement, in advance of key U.S. funding decisions expected later in 2013.

Dr. Sonia D. Batten presented highlights of the scientific accomplishments and present status of the North Pacific CPR project on behalf of AP-CPR. She reported on the Second Workshop of the Global Alliance of CPR Surveys (GACS) held in Paris September 19–20, 2012, which was also attended by Dr. Sanae Chiba. Drs. Batten and Chiba now sit on the governing body of GACS which was formally established at the Paris meeting. MONITOR members agreed to keep a good relationship with GACS.

Advisory Panel for a *CREAMS/PICES Program in East Asian Marginal Seas* (AP-CREAMS)

Dr. Joji Ishizaka, AP-CREAMS Co-Chair, presented a report on the status of the AP-CREAMS activities. The main activities of the Panel in 2012 were continued progress in improving capacity building in terms of a summer school and the oceanographic cruise on the EAST-II project. The Panel requested MONITOR's support for an upcoming NOWPAP joint summer school with IOC-WESTPAC and PICES in 2013 and a proposed PICES summer school in 2014.

FUTURE Advisory Panels

Dr. Mundy and Dr. Jennifer Boldt reported on AP-SOFE and AP-COVE activities, respectively. MONITOR agreed with the roadmap of FUTURE activities. Dr. Mundy was elected new SOFE Chairman.

AGENDA ITEM 3

PICES-2012 review

MONITOR was assigned responsibility to judge the Topic Session on “*Effects of natural and artificial calamities on marine ecosystems and the scheme for their mitigation*” (S11) and “*Monitoring on a small budget: Cooperative research and the use of commercial and recreational vessels as sampling platforms for biological and oceanographic monitoring*” (S4). The Chairman thanked the volunteers in advance for their service.

Dr. Toshihiro Wada was given the MONITOR Best Presentation Award for his talk on “*Tsunami disaster and nuclear power plant accident effects on fishery facilities and marine products in Fukushima Prefecture: present conditions and prospects*”, and Dr. Hideki Kaeriyama was presented with the MONITOR Best Poster Award for his presentation on “*Oceanic dispersion of radioactive cesium around Japan and western North Pacific after the Fukushima Dai-ichi Nuclear Power*”. (For a detailed list of award recipients, see the end of the Sessions Summary section in the [2012 Annual Report](#).)

MONITOR-2012

AGENDA ITEM 4

Country reports

Committee members from 4 member countries made short presentations on national monitoring activities relevant to PICES. The Korean report was sent to the MONITOR Chair later.

Canada

Dr. Boldt reported on continuous monitoring activities, e.g., Line-P, Bowie seamount, *etc.*, and cabled undersea networks (VENUS and NEPTUNE).

Japan

Drs. Saitoh, Chiba, and Tadokoro reported the preliminary results of research on the effect of the Great East Japan Earthquake, and the continuous monitoring activities by JAMSTEC and FRA.

Russia

Dr. Vladimir Kulik reported on the continuous monitoring activities of TINRO in the Bering Sea, Okhotsk Sea, *etc.* and on POI's activities e.g., NEAR-GOOS and CREAMS or coastal monitoring at Primorye.

USA

Drs. Mundy and Jack Barth reported U.S. ocean monitoring activities, including NaNOOS and AOOS. Some new technologies, such as the use of mobile phone applications to access ocean data, were introduced in the NaNOOS areas (Washington State, Oregon). In Alaska, AOOS has introduced new software to facilitate collaboration among ocean research groups.

China

New Chinese member, Dr. Zhifeng Zhang, reported on China's current activities of ocean monitoring, especially on recent advanced coastal research. (It is the first time since 2008 that a Chinese member has attended a Committee meeting.)

Korea

No Korean member attended this meeting, but afterwards, Korean members informed the Chairman that they are in the process of reorganizing the membership in MONITOR.

AGENDA ITEM 5

Relations with international/national organizations and programs

The representatives of the following organizations attended the Committee meeting and reported their activities.

Argo

Argo representative, Dr. Toshio Suga, reported current activities, showing a map of the buoy locations. To date, one million profiles have been conducted.

SAHFOS

SAHFOS representative, Dr. Sonia Batten, reported the current status of CPR activities. Global Alliance of CPR Studies (GACS) was established last year and PICES members (Dr. Batten and Dr. Chiba) belong to the governing body of GACS. MONITOR agreed that PICES should continue its good relationship with SAHFOS and their activities on CPR.

PAG

The representative of the Pacific Arctic Group (PAG), Dr. Takashi Kikuchi, reported on monitoring activities in Arctic area of the Pacific (*e.g.*, Bering Sea and Chukchi Sea). Since the Group's area of interest overlaps the PICES region, the exchange of research information between PAG and PICES is important.

AMAP

AMAP (Arctic Monitoring and Assessment Programme) representative, Dr. Ken Drinkwater, introduced recent activities. The research area of AMAP is the whole Arctic, and they wish to establish and maintain research relationships with both PICES and ICES. MONITOR agreed that joint activities with Arctic monitoring are important for ocean monitoring in the North Pacific, since the Arctic Council includes the Bering Sea and the Aleutian Islands in its definition of the Arctic.

SCOOS

The representative of SCOOS, Dr. Tony Koslow, introduced activities and stated that the main research area of SCOOS is the southern border of the PICES area. SCOOS exchanges information from its ocean monitoring with other ocean observing systems to the north, such as NaNOOS and PacOOS.

NEAR-GOOS

Representative, Dr. Hee Dee Jeong, talked about NEAR-GOOS activities. Since the Asian marginal seas are one of the important PICES research areas for PICES members, especially in the western Pacific, it was recommended that PICES keep a regular relationship with NEAR-GOOS.

AGENDA ITEM 6

MONITOR Action Plan and proposal for continuing NPESR

The Committee Chairman reviewed the Action Plan and requested comments from the membership and guests. The Committee Vice-Chairman, Dr. Mundy, reviewed a proposal to automate the production of the NPESR, making it a web-based product updated on an annual basis, with a variety of paper products such as brochures and reports, produced less often.

AGENDA ITEM 7

PICES Ocean Monitoring Service Award (POMA)

The Committee Chairman reviewed the role of MONITOR to nominate and recommend candidates for POMA to Science Board. Russian member, Dr. Kulik, informed the Committee about plans to nominate Russian activities to POMA.

AGENDA ITEM 8

Planning for PICES-2013 and inter-sessional meeting

MONITOR strongly supported the following proposals for PICES-2013:

1. "Towards the development of low-cost cooperative ocean monitoring networks" (MONITOR Endnote 3)
2. "Recent trends and future projections of North Pacific climate and ecosystems" (WG 29 Endnote 5)

MONITOR members determined that the title of # 1 should be revised, because the target sounded too narrow. A MONITOR member will contact the proponents of the Topic Session.

MONITOR-2012

AGENDA ITEM 9

Other business

Dr. Jack Barth (USA) informed the Committee that the Ocean Monitoring Summer School will be held in Newport, Oregon, from August 19–23, 2013.

MONITOR Endnote 1

MONITOR participation list

Members

John A. Barth (USA)
Jennifer Boldt (Canada)
Sanae Chiba (Japan)
Vladimir Kulik (Russia)
Vyacheslav Lobanov (Russia)
Phillip R. Mundy (USA, Vice-Chairman)
Sei-Ichi Saitoh (Japan)
Hiroya Sugisaki (Japan, Chairman)
Zhifeng Zhang (China)

Observers

Sonia D. Batten (SAHFOS, CPR-AP, GACS)
Jackie Gambier (AMAP)
Joji Ishizaka (CREAMS-AP)
Hee Dee Jeong (NEAR-GOOS)
Takashi Kikuchi (AMAP)
Tony Koslow (SCCOOS)
Yoshioki Ozeki (FRA)
Toshio Suga (Argo)
Kazuaki Tadokoro (FRA)

MONITOR Endnote 2

MONITOR meeting agenda

October 14, 2012, 18:00–19:30 h

1. Welcome, introductions and sign-in (all)
2. Advisory Panel's report
Status of Pacific CPR program and advisory panel (Mundy)
Status of CREAMS w. POC (Ishizaka)
Report on the meetings on FUTURE (AICE: Ro, COVE: Lobanov, SOFE: Mundy)
3. Information and discussion for 2012 PICE Annual Meeting
Information for S11 (Sugisaki) and S4 (Boldt)
Judging of the best presentation award and other information (Sugisaki)

October 17, 2012, 14:00–18:00 h

4. Country reports of relevant monitor/observation activities
Canada (Boldt, Mackas)
China (Zhang, Zhao)
Japan (Chiba, Saitoh, Sugisaki)
Korea (Park, Ro, Suh)
Russia (Kulik)
United States (+NaNOOS, AOOS) (Barth, Mundy)
5. Reports of representatives from corresponding organizations
CenCOOS (Bograd)
SCOOS (Koslow)
PaCOOS (TBA)
NEAR-GOOS (Jeong)
Argo (Suga)

- PAG (Kikuchi)
 SAHFOS (Batten)
 AMAP (Drinkwater)
6. Action Plan of MONITOR and proposals for NPESR (continued from Agenda II)
 7. Report on POMA (Sugisaki)
 8. Proposals for PICES-2013 MONITOR workshops, special sessions, inter-sessional meetings (All)
 - 9 Other business (if any)
 10. Adjourn 17:50

MONITOR Endnote 3

Proposal for a 1-day Topic Session on
“Towards the development of low-cost cooperative ocean monitoring networks” at PICES-2013
[later renamed *“Cost-effective, cooperative ocean monitoring”*]

Long-term monitoring is a key component of an ecosystem-based approach to fisheries management. Data time series enable the examination of changes in oceanographic and community metrics. In addition to costly ocean monitoring systems with sensor arrays and autonomous vehicles, low cost cooperative monitoring efforts would enhance our understanding of marine ecosystems, as well as help insure their long-term viability. An important consideration for sustainable long-term ocean monitoring is the development of affordable solutions to deploying and retrieving sensors. Sustainable long-term ocean monitoring is successfully being implemented at regional scales with low-cost options as presented in the 2012 PICES Annual Meeting session entitled *“Monitoring on a small budget: Cooperative research and the use of commercial and recreational vessels as sampling platforms for biological and oceanographic monitoring”*. Researchers from many nations are now working with other ocean going stakeholders such as fishers and mariners to collect oceanographic and fisheries data for little to no deployment and retrieval costs. This session is intended to provide a forum for researchers to present the development and results of cooperative monitoring projects world-wide. The session will also explore the feasibility of developing low-cost and long-term cooperative ocean monitoring networks based on the lessons learned from these projects. When combined with efforts such as the Global Oceans Observing System (GOOS), cooperative ocean monitoring networks will make an important contribution to achieving data-driven ecosystem-based management.

Sponsoring Committee: MONITOR

Co-convenors: Steven J. Barbeaux (USA), Jennifer Boldt (Canada), Martin Dorn (USA), Jaebong Lee (Korea)

The Section on *Carbon and Climate*

The meeting of the Section on *Carbon and Climate* (S-CC) was held from 14:00–18:00 on October 13, 2012 at the PICES Annual Meeting in Hiroshima, Japan. Drs. James Christian (Canada) and Toshiro Saino (Japan) acted as meeting Chairs. Eleven members were present, representing all PICES member countries except Russia (*S-CC Endnote 1*). Some minor amendments were made to the meeting agenda (*S-CC Endnote 2*) which was then adopted unanimously.

AGENDA ITEM 2

Membership

There was some discussion of membership and how it relates to the goals of S-CC going forward. Some members have not attended a meeting in some time and it was discussed that they may wish to rotate off in favour of new members as the Section's goals evolve and new members are recruited to address new objectives (see below Agenda Item 7). It was agreed that the individual national delegations will discuss this with their members in the coming year, and all members will work to identify potential new members in accordance with the new objectives.

AGENDA ITEM 3

CC-S achievements in the past 12 months

PACIFICA data synthesis

The PACIFICA data files were placed in the public domain in May 2012 and a unified data product based on the final version of the Adjustment Table was developed. It was agreed that the data product will be opened by the end of this calendar year. Two unresolved issues are that the second-level QC of the CFC data was not completed and is ongoing, and that a process for updates and corrections that will inevitably be uncovered by users needs to be established.

AGENDA ITEM 4

Reports of collaborating organizations and agencies

Reports were given on several international programs relevant to the mandate of S-CC, including GLODAP (Kozyr), SOCAT (Kozyr), SOLAS (Miller), IOCCP (Kozyr), CLIVAR/GO-SHIP (Murata) and IPCC (Christian).

GLODAP (Global Ocean Data Analysis Project) is planning a GLODAP v.2 dataset which will include PACIFICA, CARINA and other datasets published since the release of v.1. PACIFICA accounts for 280 of 654 cruises anticipated to be included (about as many as GLODAP v.1 and CARINA combined).

SOLAS (Surface Ocean – Lower Atmosphere Study) hosted an Open Science Conference May 7–12 in Cle Elum, WA, USA. There were 190 attendees, with 47% from PICES member countries. Three of 5 student poster award recipients were from PICES countries. SOLAS will host a Summer School from August 23–September 2, 2013 in Xiamen, China. This will be the first SOLAS Summer School held in a PICES member country. SOLAS will be requesting PICES support for travel for three early career scientists from PICES member countries to attend this meeting. S-CC members endorsed this request.

The IOCCP (International Ocean Carbon Coordination Project) Scientific Steering Group met in Sopot, Poland in June. The IOCCP Secretariat has been moved from Paris, France, to Sopot. Dr. Kathy Tedesco has resigned as Project Coordinator and Dr. Maciej Telszewski is now sole Coordinator.

Dr. Murata gave a brief report on CLIVAR (Climate Variability and Predictability of the World Climate Research Programme) and GO-SHIP (Global Ocean Ship-Based Hydrographic Investigations Program) related activities, including WOCE line reoccupations by JAMSTEC and JMA in the northern North

Pacific, western North Pacific, and Southern Ocean. A workshop will be held in the Netherlands in November to advance the development of an “International Nutrients Scale System” to improve the global comparability of nutrient data. Dr. Murata will attend this workshop. Several other S-CC members are on the Working Group charged with developing this product.

The IPCC Fifth Assessment Report (AR5) is currently undergoing Expert Review and revision of the First-Order Drafts. Dr. Christian gave a brief review of timelines for review of the reports of Working Groups I (“Physical Science Basis”) and II (“Impacts, Adaptation and Vulnerability”) and encouraged all members to take part in the process. There are at least one Convening Lead Author, one Lead Author, and two Contributing Authors among the membership, and at least 4 others who have acted as Expert Reviewers.

AGENDA ITEM 5

Report on the International Workshop to “Develop an Ocean Acidification Observing Network of Ship Surveys, Moorings, Floats and Gliders”

A workshop to develop an international Ocean Acidification Observing Network was held in Seattle, USA, in June. Ten S-CC members representing 5 different PICES member countries attended. Dr. Burke Hales gave a brief report about progress towards completion of the workshop final report, which is not yet published. It is expected that the report will recommend a set of core measurements and standards for data quality that will be required for inclusion in the network, as well as protocols for data sharing.

AGENDA ITEM 6

Report on the FUTURE workshop

A 2½-day workshop on a FUTURE Roadmap was held in Busan, Korea from May 24–26, 2012, with representation from various PICES expert groups. Drs. Christian and Toru Suzuki attended, representing S-CC. Dr. Christian gave a brief report on this meeting and discussed ways of aligning future S-CC activities with the FUTURE Science Plan (see below Agenda Item 7).

AGENDA ITEM 7

Future goals and objectives

Completion and publication of PACIFICA

With the technical phase of PACIFICA complete, there is still substantial work to do in terms of documentation of the process and analysis of the resulting data product. It was decided that all participants would be contacted with respect to previous and/or on-going commitments to analysis and synthesis activities, and additional such analyses solicited. It is expected that such analyses will generate about 6–7 papers which will be published in a journal yet to be determined. Dr. Lisa Miller volunteered to act as a Guest Editor if a special issue can be arranged. Several possible choices for the target journal were discussed.

Topic Session for PICES-2013

A topic session has been proposed for the PICES 2013 Annual Meeting by Drs. Minhan Dai, Sophia Johannessen, and Dong-Jin Kang, entitled “*The changing carbon cycle of North Pacific continental shelves and marginal seas*” (see S-CC Endnote 3).

Integration with FUTURE

Plans for the coming years and integration of S-CC into FUTURE were discussed at length. An intensified focus on coastal oceans and marginal seas has been a theme in such discussions for some years, but no one has been yet identified who will actually undertake the relevant activities. Membership renewal was discussed with respect to future activities, and it was agreed that new members should be solicited who will bring resources to address these issues. The Topic Session proposed for 2013 represents a first step,

but it is unclear whether the three members who have proposed this session have adequate resources to undertake the envisioned activities.

Analysis of the PACIFICA data product also falls under FUTURE-related activities and will be a focus of activity over the next year or two. These analyses are expected to address a number of issues central to FUTURE, including evolution of ocean acidification and deoxygenation and their effects on ecosystems.

S-CC Endnote 1

S-CC participation list

Members

Liqi Chen (China)
 James Christian (Canada, Co-Chairman)
 Burke Hales (USA)
 Masao Ishii (Japan)
 Alex Kozyr (USA)
 Kitack Lee (Korea)
 Lisa Miller (Canada)
 Akihiko Murata (Japan)
 Tsuneo Ono (Japan)
 Toshiro Saino (Japan, Co-Chairman)
 Toru Suzuki (Japan)

Observers

Alexander Bychkov (PICES)
 Taka Ito (USA)
 Keith Rodgers (USA)
 Atsushi Tsuda (Japan)

S-CC Endnote 2

S-CC meeting agenda

1. Opening (Christian, Saino)
 - Review and adopt agenda
2. Membership
3. S-CC achievements in the past 12 months
 - PACIFICA Data Synthesis (Ishii, Suzuki)
4. Information Exchange
 - GLODAP (Kozyr)
 - SOLAS-IMBER (Miller)
 - IOCCP (Kozyr)
 - SOCAT (Kozyr)
 - CLIVAR/GO-SHIP (Murata)
 - IPCC (Christian)
5. Report on International Workshop to “*Develop an Ocean Acidification Observing Network of Ship Surveys, Moorings, Floats and Gliders*” (Hales, K. Lee, Murata)
6. Report on Busan FUTURE workshop (Christian, Suzuki)
7. Future goals and objectives
 - Completion and Publication of PACIFICA
 - Topic Session for PICES-2013
 - Integration with FUTURE

S-CC Endnote 3

Proposal for a 1-day Topic Session on “*The changing carbon cycle of North Pacific continental shelves and marginal seas*” at PICES-2013

Coastal waters link the atmosphere, the land and the open ocean, both dynamically and biogeochemically. Consequently, the carbon cycle of the continental shelves and marginal seas that ring the North Pacific is particularly complex and prone to rapid changes induced by global climatic and regional anthropogenic forcings. Among others, these drivers include increasing temperature, ocean acidification, eutrophication, and deoxygenation of seawater. Such changes represent a great potential for harm to the ecosystems and fisheries that rely on these highly productive waters. We invite presentations on ocean acidification, hypoxia, eutrophication and other topics related to the biogeochemistry of organic and inorganic carbon in Pacific continental shelves and marginal seas.

Sponsoring Committee: POC

Co-sponsor: SOLAS

Proposed convenors: Minhan Dai (China), Sophia Johannessen (Canada), and Dong-Jin Kang (Korea)

The Section on *Ecology of Harmful Algal Blooms in the North Pacific*

The Section on *Ecology of Harmful Algal Blooms in the North Pacific* (S-HAB) met under the chairmanship of Drs. Vera Trainer and Changkyu Lee from 14:00 to 18:00 h on October 13, 2011, in Hiroshima, Japan. The meeting was attended by members from Canada, China, Japan, Korea, Russia, and the United States of America. Other visiting scientists attended the meeting under their respective countries (*S-HAB Endnote 1*). The proposed agenda for the meeting (*S-HAB Endnote 2*) was reviewed by the Section and approved.

AGENDA ITEM 2

Country reports and HAE-DAT usage

Canada

In 2011, a diarrhetic shellfish poisoning (DSP) event resulted in 60 illnesses on Salt Spring Island, British Columbia. This incident showed that toxic shellfish transported to other areas of Canada could result in a country-wide problem. A *Heterosigma akashiwo* bloom occurred at Departure Bay in 2007 and 2011. The year 2011 showed a more intensive bloom compare to 2007. Domoic acid in mussel tissue had a bit higher toxic level in 2007. More paralytic shellfish toxins closures were observed in 2011 than 2007

China

In China, three types of problematic tides are observed: Red tide, Green tide, and Brown tide. Most notable were *Cochlodinium polykroides* (Southern China) and *K. mikimotoi* blooms in 2012.

Japan

In 2011 there were 245 cases of harmful algal bloom events including 387 in the East, 98 on Seto Inland, and 110 on Kyushu Island. There were 20 cases of fisheries damage, 18 PSP toxin closures and 14 DSP toxin closures. An interesting correlation with the effect of the tsunami in Japan was observed after the Tohoku earthquake in 1960. During the following year, a large PSP event resulted in 1 death and 10 illnesses. Over 8–10 times higher numbers of cysts were observed after the tsunami. A 2012 *Karenia* bloom resulted in a large economic damage of over 14 billion USD on the west side of the Shikoku area. Unusually heavy rainfall was the most important factor. In the early phase, the bloom was in 5–8 m layer of the water column; in the later phase, the bloom was in the surface layer, as determined by a vertical profiler.

Korea

Cochlodinium polykrikoides was observed at 41 cells/mL in 2010 and 1 cell/mL in 2011. In 2012, large *C. polykrikoides* blooms were associated with very high water temperatures (7–12°C in August), and higher salinity water compared to other years. A continuous *C. polykrikoides* bloom in 2012 pointed to the possibility that this strain may have had different genetic characteristics. Usually *C. polykrikoides* dies at temperatures below 20°C but several thousand cells were observed even below 20° in 2012. In 2012, the total number of HAB events was 33, with fish kill events totaling 20 and non-fish kill events at 13. An ongoing project involves monitoring around Jeju Island whose biogeography, favorable substrate and genetic diversity makes it an ideal study site. Monitoring of benthic dinoflagellates from macroalgae by scuba has shown some ciguatoxin-producing species in Korean waters.

Russia

Okadaic acid in bivalve tissues from Amurskii Bay ranged from 54.46 to 247.1 µg/ kg in June 2012. The level of okadaic acid was >160 µg/ kg in May, June, and November. Five species of *Pseudonitzschia* were observed in Amurski Bay waters in 2012. Epiphytic dinoflagellates observations included 2 species. Mycocytes and trichocysts were concentrated in the upper area *Ostreopsis* cells. Potentially toxic dinoflagellates were observed in Amurskii Bay and Peter the Great Bay.

S-HAB-2012

USA

The Alaska Harmful Algal Bloom (AHAB) monitoring partnership is a volunteer-based program that provides early warning of HABs to shellfish growers in Alaska. Weekly phytoplankton monitoring joined with on-site microscopy allows volunteers to identify HAB species in a timely fashion. In Washington State, the Department of Health, Washington Sea Grant, and the NOAA Marine Biotoxins Program are working together to develop an early warning system, called SoundToxins, for HABs in Puget Sound. This program has helped to identify problem sites for new *Dinophysis* blooms that produce diarrhetic shellfish toxins. Monitoring toxins in shellfish has shown that diarrhetic shellfish toxin 1 and not okadaic acid, is the primary toxin in shellfish in this region. The Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) sponsored "Living Laboratory Ecosystem Approach" is characterizing toxins produced by *Heterosigma akashiwo*, a flagellate that causes millions of dollars loss to the net-pen salmon fishery. In 2012 in Oregon, a small number of *Pseudo-nitzschia* were observed, and some paralytic shellfish toxins. In northern California, *Gonyaulax spinifera* caused a massive dieoff of invertebrates, including sea stars and abalone. A major kill of chinook salmon (larger fry) in Alaska was observed, possibly due to HABs.

AGENDA ITEM 3

S-HAB new Terms of Reference

There is a strong need to ascertain what currently is known about the environmental conditions that favor initiation and maintenance of different types of harmful algal bloom (HAB) events, and the natural vs. anthropogenic driving mechanisms that influence their prevalence. This critical assessment will serve as a springboard to focus attention on the research issues of greatest importance over the next decade. It also will help to proactively identify the fundamental parameters and research infrastructure needed to effectively hindcast current changing HAB distributions, the first step in gaining the capacity to forecast future HAB patterns in a changing climate. S-HAB revised Terms of Reference can be found in *S-HAB Endnote 3*.

AGENDA ITEM 4

The joint Harmful Algal Bloom Programme and International Oceanographic Data and Information Exchange Harmful Algae Information System: An update and country maps

Dr. Henrik Enevoldsen (IOC) could not attend the PICES meeting, but sent a presentation to be given at the HAB-S meeting on his behalf. HAE-DAT decadal maps for PICES member countries have now been created and will soon be posted on the ICES website. The goal of HAE-DAT decadal maps of HAB events is to provide a global and immediate view of harmful events around to whole world for the past decade. One map is created per toxin syndrome. The product was developed by IFREMER (France) with IOC using Google maps API. To date, PICES member countries have entered 375 events (USA), 285 events (Japan), 262 events (Canada), Korea (8 events), Russia (3 events) and China (2 events). All PICES member countries are currently adding events and the database should be updated to 2007 this year.

AGENDA ITEM 5

Report on ICES meeting and areas of ICES/PICES collaboration

A more rigorous assessment of purported links between anticipated climate-driven changes and HABs will be accomplished in 2 stages:

Stage I. A 5-day international conference is planned for March, 2013, co-organized by Mark Wells (PICES S-HAB) and Bengt Karlson (ICES/IOC-WGHABD) and jointly sponsored by PICES, IOC/SCOR, NOAA, GeoHAB (and ICES). A focused group (~15) of key individuals with different expertise that bears strongly on climate change/HAB linkages will review what is known and unknown about HAB/Climate linkages. This will result in production of a seminal paper identifying the keystone parameters and research infrastructure needed to test these purported linkages.

Stage II. The above conference will define the organizational structure and Steering Committee for a broad International Open Science Meeting on HABs and Climate Change that would be planned for the following year (2014, 2015).

The 2013 ICES-IOC WGHABD meeting will be held in Belfast, Northern Ireland from April 9–12, 2013. PICES travel support will be requested for a S-HAB member to participate in this meeting and IOC Intergovernmental Panel on Harmful Algal Blooms (IPHAB) for followup on the HAB workshop report, the Fish-Killing Algae report and for planning of the Open Science Meeting on HABs and Climate Change.

AGENDA ITEM 7

Topic Session and Workshop for PICES-2013

In addition to a 1-day S-HAB meeting, one Workshop and one Topic Session were proposed by S-HAB members for PICES-2013 (*S-HAB Endnote 4*). S-HAB meeting will include member country reports for HAB events in 2007–2008 and a discussion on HAEDAT use. Countries are requested to input HAB event data to HAEDAT for 2000–2008 directly to the online database.

A proposed 1½-day Workshop will focus on “*The economic impacts of harmful algal blooms on fisheries and aquaculture. Part 1: What is known*”; Co-convenors: Vera Trainer (USA) and Chang Hoon Kim (Korea). The ½-day Topic Session will deal with “*Emerging issues with diarrhetic shellfish poisoning*”; Co-convenors: Charles Trick (Canada), Ichiro Imai (Japan).

AGENDA ITEM 8

PICES/MAFF Seafood Safety Project - Final report

A “responsible sentinel approach” was used by S-HAB in the PICES Seafood Safety Project (5-year project from 2007–2012, funded by the Ministry of Agriculture, Forestry and Fisheries of Japan) entitled “*Development of the prevention systems for harmful organisms’ expansion in the Pacific Rim*” in which knowledgeable and trained scientists could train students and community members in selected non-PICES member countries to watch for the “symptoms of change” caused by harmful algal bloom (HAB) events in their regional fisheries and ecosystems.

A series of training classes that covered anthropogenic changes in coastal waters, sampling and measurement of toxins and cells, the critical needs for monitoring projects, and the importance of phytoplankton in healthy, coastal ecosystems were given to community workers and regional scientists in selected Pacific communities outside the PICES region.

S-HAB members established strong relationships through routine contact to develop strong socio-ecological connections, successfully avoiding “helicopter science” but embedding themselves into the decision making of three enthusiastic communities (Manila, Philippines, 2009; San José/Guatemala City, Guatemala, 2010; Jakarta/Lombok Island, Indonesia, 2012) to ensure sustainability in current and emerging fisheries while attempting to safeguard the health of their citizenry from HABs.

In the Philippines there is strong, high-level support at the Ministry level. S-HAB has effectively integrated its toxin screening tools and other ideas into the country’s monitoring plan. In Guatemala, the government is supportive of management. The project there is sustainable in that there is monitoring in place. This program is succeeding due to a very strong leader at the University of San Carlos, Guatemala City, with strong Ministry support and connections. S-HAB wishes to further the relationship in Guatemala by continuing its collaboration during the new PICES project on “*Marine ecosystem health and human well-being (sato-umi)*” that is also being funded by MAFF. In Indonesia, S-HAB has achieved strong support with the government institution (LIPI) directorate. Training has 2 focused areas: the central facility for monitoring in Jakarta and a

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regional laboratory on Lombok Island that is interested in aquaculture development. S-HAB efforts in the South Pacific Islands was logistically challenging and focused on benthic harmful algal blooms and ciguatera. Although they were very positive regarding our collaboration, a training class was not held in this 23-island nation. We hope that future collaborations might be possible.

AGENDA ITEM 9

Review of PICES-2012 Workshop

S-HAB reviewed the 1½-day Workshop on “*The contrasting cases of HABs in the eastern and western Pacific in 2007 and 2011*”. A complete description and summary of the Workshop can be found in the Session Summary section of the PICES-2012 Annual Report.

AGENDA ITEM 10

New PICES/MAFF project

Dr. Mark Wells and Trainer on are the steering committee of the new PICES/MAFF project on “*Marine ecosystem health and human well-being*”. A primary goal will be to conduct research on ecosystem health and human well-being. The target countries and focus areas are: Indonesia (aquaculture), Guatemala (aquaculture and wild), Palau (wild). The project strategy will involve a combination of workshops and social impacts studies. Workshops will be held 2–3 times at each site. The project output will be the development of a manual for each site.

AGENDA ITEM 11

Proposal from WG 21

Ms. Darlene Smith, Co-Chair of the Working Group on *Non-indigenous Aquatic Species* (WG 21) proposed that the WG perhaps could be combined with S-HAB due to the fact that the WG 21’s term has now come to an end. There was interest by some members of the WG to continue its work, but waning motivation by some of its membership. S-HAB felt that its primary mission is to study phytoplankton and that by joining with the WG 21 scientists, the Section’s goals would be diluted.

AGENDA ITEM 12

Proposals for the future

S-HAB’s quick exchange of new findings focused on the Section’s contribution to FUTURE. For FUTURE to have any realistic hope of achieving meaningful predictions/forecasts of future ecosystem states it is critical that the link between environmental conditions and the nature of primary production be characterized. The more proactive climate/ecosystem models reduce primary producers into 2 or 3 “boxes”, based largely on size or specific function — it is critical that they now consider ecosystem disruptive primary producers, including:

- High biomass, monospecific blooms (phytoplankton, macroalgae, hypoxia),
- Toxic blooms (toxic diatoms, fish-killing species, toxic dinoflagellates),
- Food-web disruptive blooms (species that facilitate Jellyfish blooms),
- Nutritionally-inadequate blooms (physiological or species driven changes in production of essential fatty acids).

S-HAB felt strongly that it must go beyond the current focus on carbon processing/climate linkages to ecological/climate linkages — requiring an entirely new approach. Effective modeling/forecasting of ecosystem changes associated with climate change will require establishing the “windows” of opportunity for ecosystem disruptive blooms. The HAB-S will focus its efforts for FUTURE in the following areas:

- We cannot predict HABs or ecosystem disruptive blooms — we can only establish how these blooms may change temporally or geographically (aka. Environmental “Market” Reports).
- S-HAB is well positioned to provide key input to help define the edges of these “windows” which, when linked with appropriate physical and human dimension models, can provide “Market Forecast” outcomes.
- PICES S-HAB workshop and session outputs include characterizing the ecophysiology of key HAB species in the PICES region.
- HAEDAT (Global database on HAB events) will provide valuable trend datasets.

AGENDA ITEM 13

Requests to Science Board

Travel funds are requested for:

- 2 invited speakers for the PICES-2013 Workshop (tentatively Dan Leschine, USA; Grant Murray, Canada; Shigeru Itakura, Japan; and/or Ann Guerry);
- 1 expert speaker for the PICES-2013 Topic Session (tentatively Dr. Won Ho Lee, Korea, Dr. Suzuki, or Dr. Myungil Park);
- 1 local student rapporteur for S-HAB at PICES-2013;
- 1 PICES S-HAB member to attend both the ICES-IOC WGHABD meeting in Belfast, Northern Ireland, and IPHAB in Paris, France in April 2013 (1 trip);
- S-HAB requests new members to be considered either due to retirements or needed expertise. Proposed new members include: Chunjiang Guan (China), Douding Lu (HAE-DAT focal person in northern China), Stephanie Moore (USA), Chang Hoon Kim (Korea).

S-HAB Endnote 1**S-HAB participant list**Members

William Cochlan (USA)
 Chunjiang Guan (China)
 Ichiro Imai (Japan)
 Shigeru Itakura (Japan)
 Akira Ishikawa (Japan)
 Sangjin Lee (Korea)
 Changkyu Lee (Korea, Co-Chairman)
 Tatiana Morozova (Russia)
 Satoshi Nagai (Japan)
 Tatanya Orlova (Russia)
 Vera Trainer (USA, Co-Chairman)
 Charles Trick (Canada)
 Mark Wells (USA)
 Mingyuan Zhu (China)

Observers

Svetlana Esenkulova (Canada)
 Jingfeng Fan (China)
 Nicky Haigh (Canada)
 Nobuharu Inaba (Japan)
 Takeo Kurihara (Japan)
 Ruixiang Li (China)
 Masa Ohyama (Japan)
 Inna Stonik (Russia)

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S-HAB Endnote 2

S-HAB meeting agenda

Saturday, October 13, 2012

1. Welcome, goals of S-HAB meeting (Lee)
2. Country Reports (2011-12) and HAE-DAT usage
 - Canada (Trick)
 - China (Zhu)
 - Japan (Itakura)
 - Korea (Lee)
 - Russia (Morozova)
 - USA (Trainer)
3. Discussion of proposed new Terms of Reference (Lee)
4. Joint Harmful Algal Bloom Programme and International Oceanographic Data and Information Exchange Harmful Algae Information System: An update and country maps (Henrik Enevoldsen and Vera Trainer)
5. Report on ICES Meeting and Joint Workshop on HABs and Climate (Wells)
6. Assignments for the evening (All)

Sunday, October 14, 2012

Welcome and review of previous day (Trainer)

7. Discussion of Topic Session and Workshop for PICES-2013
8. PICES/MAFF Seafood Safety Project - Final Report (Trick)
9. Review of results of PICES-2012 Workshop (Wells)
10. New MAFF project, Marine Ecosystem Health and Human Well Being (Trainer)
11. Proposal from WG 21
12. Exchange of information on collaborative studies, new findings, significant publications from each country
13. Request to Science Board

S-HAB Endnote 3

Revised Terms of Reference for the Section on the *Ecology of Harmful Algal Blooms in the North Pacific*

1. Continue PICES member country data entry into the joint ICES-PICES harmful algal event database to allow global comparison of changes in harmful algal bloom occurrences;
2. Convene workshops and sessions including joint sessions with other international organizations to evaluate and compare results and maintain an awareness of state-of-the-art advances outside the PICES community;
3. Convene a joint PICES/ ICES workshop to assess the purported links between climate change and HAB character, frequency and severity, and publish a comprehensive review paper that identifies the near- and long-term research priorities and the monitoring structures needed to effectively hindcast and forecast future HAB events;
4. Produce and post on the PICES website papers that document the unanimous HAB Section opinion on timely subjects related to HABs, including topics related to FUTURE such as how human activities (increased cultural eutrophication and climate changes including temperature, changes in stratification and ocean acidification) might affect harmful algal bloom incidence and magnitude.

S-HAB Endnote 4

**Proposal for a 1½-day MEQ Workshop on
“Economic impacts of harmful algal blooms on fisheries and aquaculture” at PICES-2013**

Harmful algal blooms (HABs) have adverse economic and social impacts on the aquaculture industry, human health, coastal economies, and wild fisheries. HABs have prompted routine closures of both commercial and recreational shellfish harvesting as well as the death of aquaculture finfish resulting in financial losses in coastal communities. But the economic impacts generated by these events extend far beyond the industry itself. Obtaining more realistic estimates of HAB economic impacts, and the costs of preventing and managing them, calls for an integrated assessment approach that comprises the following; the economic impact of HABs on the aquaculture industry, the secondary integrated industries, and consumers, on both local and regional scales; some valuation of the costs and benefits of taking any recognized steps to lessen the HAB problem (e.g., reducing coastal pollution and other human-related activities); and weighing the costs and benefits of enhanced monitoring and surveillance that potentially reduces the magnitude of the impacts (e.g., by limiting shellfish harvesting closure windows or alteration in the timing of finfish harvesting). This workshop comprises 2 parts, with the first being presentation of what is known about the economic and social impacts of HABs in the eastern and western Pacific, by both HAB researchers and invited speakers who can inform on cutting edge approaches and methodologies for assessment of HAB and other marine economic impacts (e.g., oil spills). In Part 2 participants will identify specific steps for developing improved and more comprehensive economic impact assessments of HABs on fisheries and aquaculture in the north Pacific.

The thrust of the workshop, and the direct findings and insights that will be derived, directly addresses two FUTURE Research Themes, namely, (1) what determines an ecosystem’s intrinsic resilience and vulnerability to natural and anthropogenic forcing, and (2) how do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future?

Co-convenors: Vera Trainer (USA) and Chang Hoon Kim (Korea)

Invited speaker: Daniel Huppert (USA)

**Proposal for a ½-day MEQ Topic Session on
“Emerging issues with Diarrhetic Shellfish Poisoning” at PICES-2013**

While primarily associated with blooms in Europe and some Asian coasts, Diarrhetic Shellfish Poisoning (DSP)-producing blooms are increasingly shaping the phytoplankton communities in PICES nations. Some western Pacific nations have a long history of DSP problems. Now the Salish Sea (US and Canada) has recent reports of illnesses due to DSP toxins. Nations are initiating DSP analysis as a more standard seafood safety assay. Even with a rich history of research, the induction of growth of DSP-producing cells is unevenly understood. We propose to consider research details that broaden our knowledge on the three primary ecological questions: how did the DSP-producing species enter into PICES waters and what regulates their toxin production? What factors have allowed these species to out compete natural phytoplankton populations? And will these DSP-producing species remain in our coastal waters?

Co-convenors: Charles Trick (Canada) and Ichiro Imai (Japan)

The Section on *Human Dimensions of Marine Systems*

The Section on Human Dimensions of Marine Systems (S-HD) held its first meeting on October 12, 2012, from 9:00–18:00 h in Hiroshima, Japan. Drs. Mitsutaku Makino and Keith Criddle acted as meeting co-chairmen. The meeting began with brief self-introductions (*S-HD Endnote 1*) and the adoption of the meeting agenda (*S-HD Endnote 2*).

AGENDA ITEM 2

Background and Terms of Reference

Dr. Mitsutaku Makino provided a succinct review of the formation and activities of the Study Group on *Human Dimensions* (SG-HD), and key findings and recommendations of the final Study Group report were summarized. The work of SG-HD and the final report (PICES Scientific Report No. 39) provided impetus for formation of S-HD. The objective and Terms of Reference of S-HD were described. The first two TORs are the principle mission of S-HD, the third and fourth TORs deal with connections to FUTURE and cooperation with other international research organizations through, for example, organization of a symposium on human dimensions of marine ecosystems.

AGENDA ITEM 3

Presentations on work related to the S-HD objective and suggestions for activities

Each member provided a description of his/her current projects and, in some instances, the current projects of his/her research groups. The breadth of topics was exciting as was the clear overlap in interests and synergies among S-HD members in attendance. Ideas suggested for S-HD activities and S-HD member collaborations included:

- Sharing information about domestic and international markets for seafood;
- Identifying categories of information that managers and biologists need to better utilize input of social scientists;
- Identifying areas of public concern about marine ecosystems and mechanisms for scientists to provide information needed for making informed policy choices;
- Characterizing and anticipating technological evolution as it affects fishing power, processing, supply chains, and communities;
- Developing a report that describes how linkages between ecosystem services and wellbeing are conceived in PICES countries;
- Developing/sharing decision support tools;
- Developing a report that describes how social implications of conservation measures vary within and across PICES member countries and identifying commonalities;
- Developing a comparative analysis of the role that governance mechanisms and social institutions play in the value of ecosystem services and wellbeing;
- Comparative analysis of national/regional values for seafood;
- Comparative analysis of national/regional constituents of wellbeing.

AGENDA ITEM 4

Discussion of Terms of Reference and plans for Year 1

Human wellbeing and ecosystem services in marine social-ecological systems (TOR 1)

The PICES-MAFF project will seek to begin addressing this TOR using a multidimensional assessment method drawn from recent work in positive psychology. Section members suggested that other methods of

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analysis, *e.g.*, key informant interviews, workshops with group discussions (voting on importance of linkages), and expert assessment with feedback, could also be used either in combination with the work in positive psychology or in stand-alone studies to illustrate the relative strengths of the different mechanisms for elucidating information on linkages between ecosystem services and wellbeing for different categories of stakeholders and resource managers. It was also suggested that it might be informative to include consideration of mediating structures (*e.g.*, governance mechanisms) as they affect the quality of ecosystem services, how they affect wellbeing, *etc.* S-HD supported holding a 1-day Topic Session on “*Marine ecosystem services*” (S-HD Endnote 3) at PICES-2013.

Social and economic impacts of climate-induced changes in marine ecosystems (TOR 2)

The disciplines and analytic methods outlined in Table 3.1 of the SG-HD final report were reviewed and discussed. It was agreed that although the list is not comprehensive, it includes a reasonably complete listing of the major analytic tools and approaches that the social sciences can contribute to assessment of the demand for ecosystem services, the governance of marine SES, and resultant levels of wellbeing of individuals and their communities. It was, however, noted that the list only provides a cursory representation of non-fishery uses of marine ecosystems, such as tourism, marine transportation, marine pollution/debris, *etc.* and aligned tools, such as Marine Spatial Planning/Ocean Zoning. It was agreed that developing a list of indicators of ecosystem services is a worthy goal for Year 1, with outcomes to be presented at the S-HD meeting during PICES-2013.

Results from Study Group on Communication (TOR 1)

The recommendations included in the final project report for Study Group on *Communication* (see SG-COM in the 2009 Annual Report) were reviewed for their potential applicability to S-HD activities and products and as an example of the scope of activities typical of a PICES section.

Annual work plan

Newsletter—S-HD will provide regular contributions to the PICES Press newsletter (2X/year). These contributions will illustrate what the social sciences can contribute to a holistic understanding of marine social-ecological systems (SES). In the first newsletter contribution, Dr. Makino will summarize the SG-HD report. The second contribution, organized by Dr. Ron Felthoven, will describe social indicators recently adopted by the U.S. NMFS. In the future, the contributions will be organized around topics or issues rather than by discipline. These contributions might include interpretive summaries of hot topics recently published in the social science literature as they pertain to the sustainable SES.

Symposium—the TORs specify that S-HD will sponsor a symposium. It was agreed that it would be most useful to organize this symposium to take place in 2015 or 2016. It is expected that the symposium would be 2-3 days long and might be in partnership with, *e.g.*, IMBER, ESSAS, ICES, or FAO. Section members expressed concern that the symposium be structured to draw an audience representing the array of PICES interests in ecosystem services rather than a narrow audience of social scientists.

Topic Session at PICES-2013—as described above, S-HD members will work with the co-convenors of the proposed topic session on “*Marine ecosystem services*”.

Other PICES-2013 activities—S-HD may collaborate with S-HAB to develop a workshop with Canadian First Nations peoples on coastal pollution, nearshore subsistence resources, and the wellbeing of communities and societies. There might also be collaboration on a session involving trends in coastal marine pollutants, toxins, and the value of ecosystem services.

S-HD Endnote 1**S-HD participation list**Members

Keith Criddle (USA, Co-Chairman)
 Ekaterina V. Golovashchenko (Russia)
 Alan Haynie (USA, alternate for Ron Felthoven)
 Masahito Hirota (Japan)
 Juri Hori (Japan)
 Ekaterina Kurilova (Russia)
 Olga N. Lukyanova (Russia)
 Mitsutaku Makino (Japan, Co-Chairman)
 Grant Murray (Canada)
 R. Ian Perry (Canada)

Observers

Takayomi Kaneko (Japan)
 Denis Kotsyuk (Russia)
 Pavel B. Mikheev (Russia)
 Robin Brown (Canada)
 Tetsuo Yanagi (Japan)

S-HD Endnote 2**S-HD meeting agenda**

1. Opening, introductions, and agenda
2. Background of S-HD and the affirmation of TOR
3. Member presentations on their work relating to the S-HD objective and their suggestions for S-HD activities
4. Discussion of TORs and planning for Year 1
 - Human wellbeing and ecosystem services in marine social-ecological systems (TOR 1)
 - Social and economic impacts of climate-induced changes in marine ecosystems (TOR 2)
 - Results from SG-Com (TOR 1)
 - Annual work plan and newsletters (including session proposal)
 - Relationship/synergy with PICES/MAFF project
5. Concluding remarks

S-HD Endnote 3

Proposal for a 1-day Topic Session on “*Marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being*” at PICES-2013

Marine ecosystem services are the benefits people obtain from the sea and ocean. Since the UN Millennium Ecosystem Assessment reports were published in 2005, the concept of ecosystem services has been broadly accepted by politicians, scientists, developers and the public. When politicians make policy decisions, they should know the value of the marine ecosystem services involved, and how much economic development and human well-being the marine ecosystem may support. As scientists, we have the responsibility to give the answers or the best estimates to these questions. The goals of this session are to provide scientists with a platform to exchange results from research on marine ecosystem services and to show how they contribute to the economy and human well-being. In turn, these research activities will be a demonstration of the contributions and significance of the work being done on this topic within PICES communities, including marine-related research institutes, universities, and management agencies, to marine science and national economies.

Sponsoring Committee(s): BIO/FIS

Potential Co-sponsors: IMBER

Convenors: Shang Chen (China), Keith Criddle (USA), Ekaterina Golovashchenko (Russia), Mitsutaku Makino (Japan), Jungho Nam (Korea), Minling Pan (USA) and Ian Perry (Canada)

Potential invited speakers: TBA

The Working Group on *Non-indigenous Aquatic Species*

The Working Group on *Non-indigenous Aquatic Species* (hereafter WG 21) held its seventh meeting October 17, 2012 under the chairmanship of Darlene Smith who presented opening remarks and welcomed participants. WG 21 members from four PICES member countries (Canada, Japan, Korea and the United States) and observers from the Northwest Pacific Action Plan (NOWPAP) attended (*WG 21 Endnote 1*). The agenda for the meeting can be found in *WG 21 Endnote 2*.

AGENDA ITEM 2

NOWPAP alien species workshop

Dr. Sangjin Lee provided an overview of NOWPAP activities related to aquatic invasive species. NOWPAP has developed a Medium Interim Strategy 2012–2017 that comprises five areas of focus of which “biodiversity conservation” is of most relevance to WG 21. The biodiversity conservation focus includes:

- information sharing on current situation with biodiversity, including Marine Invasive Species (MIS) and
- application of international regulations for the prevention of alien species invasions.

NOWPAP has initiated a project to hold a regional workshop on “*MIS problems in northwest Pacific region*”. The funding is from the Asia-Pacific Network for Global Change Research. The workshop will be held October 23–24, 2012, in Qingdao, China. Experts from China, Japan, Korea and Russia will participate. The workshop objectives are to:

- exchange information on MIS problems among officials and experts from NOWPAP member states;
- exchange experiences on the prevention and control of MIS problems among officials and experts from NOWPAP member states;
- analyze the needs for policies and measures on MIS problems and recommendations for NOWPAP member states.

Specific topics to be discussed are:

- the current situation of MIS problem in the NOWPAP region;
- experiences and good practices on the prevention and control of MIS problems;
- challenges in prevention and control of MIS problems;
- needs for policies and measures on MIS problems in NOWPAP member states; and
- necessity and ways of cooperation among NOWPAP member states for the prevention and control of MIS problems in NOWPAP region.

AGENDA ITEM 3

Ballast water monitoring in Korea

Dr. Jung-Hoon Kang from the Korean Institute of Ocean Science and Technology (KIOST) provided a presentation on a Planning Project launched September 12, 2012. Under this project 12 ports are to be monitored for 5 years. The project’s objectives are to obtain historical and current data required for risk analysis to control and reduce the hazardous effects of foreign species

AGENDA ITEMS 4, 5 AND 6

MAFF-funded projects – final update

A final project report was submitted to the Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF).

A brochure on the PICES Nonindigenous Species Information System, the Atlas of Nonindigenous Marine and Estuarine Species in the North Pacific, and Rapid Assessment Survey Projects were also published.

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Atlas and database

Dr. Deborah Reusser gave a demonstration of the PICES Nonindigenous Species Information System and the Atlas of Nonindigenous Marine and Estuarine Species in the North Pacific. The database and atlas have been finalized and are available online at *the Coastal Biological Risk Analysis Tools (CBRAT) website*: https://cbrat.nationalatlas.gov/PICES_NISIS_download.html. The database and atlas can be accessed as follows:

The PICES Nonindigenous Species Information System

View the install instructions for the PICES_NISIS Database. The database is a .zip file. Once downloaded, you will need to unzip it and then follow the install instructions for the appropriate operating system. View the Users Guide and Metadata for the PICES_NISIS Database.

The Atlas of Nonindigenous Marine and Estuarine Species in the North Pacific

This atlas provides summary information on the species in the PICES_NISIS Database along with statistical analyses for the North Pacific regions on the distributions of nonindigenous species at the ecoregion and regional scale for the six North Pacific Marine Science Organization (PICES) member countries. Articles will be prepared for PICES Press to publicize the database and atlas. The metadata for the database and atlas will be entered into the TCODE information system. The data will be included in the Species at Risk to Multiple Climate Stressors (risk analysis tools) on the CBRAT website. It is anticipated that experts will be able to add additional NIS records in 2013 and that general public access will be available in 2014. Canada noted that it benefited greatly from information in the PICES NIS database to develop responses to non-indigenous species that arrived on debris resulting from the March 11, 2011 Tōhoku earthquake and tsunami.

Taxonomy project

The final Rapid Assessment Survey Demonstration Workshop was held February 8–9 at the Seikai National Fisheries Research Institute of the Fisheries Research Agency in Nagasaki, Japan. The workshop was co-convened by:

- Dr. Takeo Kurihara, Seikai National Fisheries Research Institute, Japan
- Dr. Suchana (Apple) Chavanich, Chulalongkorn University, Thailand and WESTPAC
- Dr. Sangjin Lee, NOWPAP
- Dr. Thomas Therriault, Fisheries and Oceans Canada

Approximately 25 participants from 7 countries (China, Indonesia, Japan, Korea, Philippines, Thailand and Vietnam) participated in the workshop.

AGENDA ITEM 7

Review of final WG 21 report

A draft of the final report was reviewed and suggestions made for completion. The revisions will be forwarded to all Working Group members for comment prior to finalization.

AGENDA ITEM 8

Discussion and recommendations for future NIS activities in PICES

Having completed its original mandate, WG 21 concluded that non-indigenous species (NIS) will continue to be an issue of significant concern for PICES members. Discussion considered various options for continuing work on NIS. Briefly, WG 21 recommends that PICES should utilize and build upon the NIS database and atlas tools to focus on how future global climate change and anthropogenic vectors will change the distribution of NIS in the North Pacific and to undertake risk identification to inform mitigation measures by PICES member countries. Revised terms of reference and further discussion of NIS activities can be found in *WG 21 Endnote 3*.

WG 21 Endnote 1**WG 21 participation list**Members

Blake Feist (USA – by correspondence)
 Graham Gillespie (Canada)
 Jung-Hoon Kang (Korea)
 Takeo Kurihara (Japan)
 Deborah Ann Reusser (U.S.A.)
 Hajime Saito (Japan)
 Kyoungsoon Shin (Korea)
 Darlene Smith (Canada, Co-Chairman)
 Thomas Therriault (Canada)

Observer

Sangjin Lee (NOWPAP of UNEP)

WG 21 Endnote 2**WG 21 meeting agenda**

1. Opening remarks and introductions (Darlene Smith)
2. NOWPAP alien species workshop (Sangjin Lee)
3. Ballast water monitoring in Korea (Jung-Hoon Kang)
4. MAFF-funded projects – final update
5. Atlas and database (Deborah Reusser)
6. Taxonomy project (Therriault)
7. Review of final WG 21 report (All)
8. Discussion and recommendations for future NIS activities in PICES (All)

WG 21 Endnote 2**Terms of reference for a one-year extension of WG 21**

1. develop a proposal for continued NIS work that builds upon the work completed by WG 21 and that meets the objectives of FUTURE and the MEQ Action Plan and illustrates how it would integrate with other MEQ expert groups to achieve these objectives;
2. publicize and promote the use of the NIS database and Atlas; and
3. investigate and make recommendations for collaborations on NIS with other international marine science organizations including NOWPAP, WESTPAC and ICES.

Future of NIS activities within PICES

While WG 21 has successfully completed its terms of reference, this does not mean that the problem of marine NIS has been solved in the North Pacific. The natural next step is to build upon the database and accomplishments of this Working Group and move forward in the area of marine NIS interactions with marine ecosystems. With the completion of the comprehensive database on marine NIS distributions in the North Pacific, the database can now be utilized in the next logical step of gaining predictive insight to the changes and impacts of NIS. Of particular interest is how projected global climate change (GCC) will affect the introduction, spread and impacts of NIS. GCC and the associated decrease in Arctic ice cover and opening of new shipping routes also poses questions related to the introduction and spread of NIS. Interest has also been expressed in addressing specific taxa of common interest to many PICES member countries (*e.g.*, tunicates). Collaboration with other international organizations on NIS will be a benefit to PICES. NOWPAP, WESTPAC and ICES are of particular importance in this regard. The option of simply moving forward with

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annual or biennial topic sessions was proposed but without a formal group structure this would be difficult to sustain.

WG 21 developed the following options for continuing work on NIS within PICES:

1. Creation of a Section on Marine Biological Pollutants Focused on NIS,
2. Creation of a Working Group on NIS,
3. Creation of an Advisory Panel on NIS,
4. Amalgamation with S-HAB.

Each alternative is discussed in greater detail.

1. *Creation of a new Section on Marine Pollutants*

The NIS group could be the primary focus of biological pollution in North Pacific.

2. *Form a new Working Group*

The following draft terms of reference were prepared by Dr. Blake Feist who has indicated he is willing to co-chair a new working group on NIS.

1. Review and summarize the current knowledge of pelagic marine NIS spatio-temporal distributions in the North Pacific;
2. Collaborate with physical oceanographers to better understand the role of ocean circulation patterns in marine NIS range expansion and how that range expansion may be affected by GCC (Direct link with S-HAB);
3. Use publicly available geospatial databases and the WG 21 NIS database to explore the relationship between biodiversity, anthropogenic forcing and NIS, particularly in coastal ecosystems (potential collaboration with NOAA Fisheries);
4. Generate peer reviewed manuscript describing relative risks imposed by selected pelagic marine NIS proliferation in the North Pacific and how they alter ecosystem services;
5. Plan and coordinate a symposium, workshop or an annual meeting session on the marine NIS

What will set this new Working Group apart:

- It will explicitly integrate with other working groups and sections (S-HAB, WG 28, WG 24, *etc.*).
- It will produce peer reviewed papers as final products, which will better engage academics and provide focus for specific reference terms. This also reduces the risk of setting unobtainable goals.
- It will explicitly incorporate ecosystem level (ecosystem services, food web dynamics, community structure, trophic ecology, *etc.*) priorities that are more useful to PICES member countries.
- It will explicitly incorporate major forecasted shifts in ocean conditions (temperature, primary productivity, pH, hypoxia, upwelling, *etc.*) and how NIS may or may not respond differently from native species to these changes.

3. *Form a new Advisory Panel on NIS*

- Focus on exchange of information related to changes to diversity, distribution, impacts, issues, mitigation, regulation among PICES member countries and between other international organizations (*e.g.*, NOWPAP, WESTPAC and ICES)
- Provide recommendations on PICES NIS activities including linkages with other relevant working groups and sections.
- Develop and implement proposals for workshops and theme sessions at future PICES meetings.
- Develop and implement data, information, and technical standards for NIS in the NP (*e.g.*, monitoring tools, risk assessment procedures, mitigation or control options, *etc.*)
- Model after ICES approach for annual reports from countries including updates of data to the PICES NISIS database.

4. *Amalgamate with S-HAB*

- While the S-HAB has indicated an interest on focusing on climate change in their draft terms of reference, the Section intends to remain focused on phytoplankton.
- The NIS issue goes well beyond phytoplankton so if this was a desired direction, MEQ would need to clarify if a new Section would resemble the MAFF Project teams.

Relevance of continued NIS activities to FUTURE

WG 21 has developed tools that would allow FUTURE to use information on NIS as an index of a specific anthropogenic stressor. However, to implement this in the context of FUTURE (see below) it will be necessary to update this index as a time series for each ecoregion. This index could be included in the next NPESR. Further, a continued NIS expert group would allow exploration of climate change models on the most probable changes in NIS distributions around the North Pacific and to identify likely changes in NIS vectors (*e.g.*, new shipping routes, expanding trade, *etc.*). The last component this new expert group could address is how PICES member countries have been affected by NIS and what community responses have occurred due to NIS incursions in the North Pacific.

FUTURE scientific priorities

- The effects of climate and climate change on physical, geochemical and biological processes at geographical scales ranging from the North Pacific basin and its marginal seas to the coastal regions of interest to PICES member countries;
- Direct and indirect effects of human activities, such as fishing, aquaculture, introduced species, habitat alteration, pollution, and greenhouse gas emissions and their consequences for member countries.

FUTURE Research Themes

- 1.2. How might changing physical, chemical and biological processes cause alterations to ecosystem structure and function?
- 1.5. What thresholds, buffers and amplifiers are associated with maintaining ecosystem resilience?
- 2.1. How has the important physical, chemical and biological processes changed, how are they changing, and how might they change as a result of climate change and human activities?
- 2.2. What factors might be mediating changes in the physical, chemical and biological processes?
- 2.5. How are human uses of marine resources affected by changes in ecosystem structure and function?
- 3.3. How do multiple anthropogenic stressors interact to alter the structure and function of the systems, and what are the cumulative effects?
- 3.4. What will be the consequences of projected coastal ecosystem changes and what is the predictability and uncertainty of forecasted changes?

Working Group 26 on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequences*

The second meeting of PICES WG 26 (*Jellyfish Blooms around the North Pacific Rim: Causes and Consequence*) was held October 14, 2012, in Hiroshima, Japan. The meeting was chaired by Dr. Shin-ichi Uye and Dr. Richard Brodeur. The third Co-Chair, Dr. Won-Duk Yoon, was not able to attend. A new Japanese WG member, Dr. Masaya Toyokawa, met with the group for the first time. All PICES member countries were represented at the WG meeting and many prominent jellyfish scientists from ICES member countries also attended and provided useful comments and suggestions. A total of 12 members and 11 observers participated in the meeting (*WG 26 Endnote 1*). The agenda for the meeting can be found in *WG 26 Endnote 2*.

AGENDA ITEM 3

Report on the preparation of the S7: BIO/FIS Topic Session

A brief report on the preparation for, and status of, the 2012 Topic Session on “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*” was presented. The Convenors (Drs. Brodeur, Uye, Yoon, and Song Sun of PICES) and their ICES Co-convenors from Europe (Dr. Chris Lynam of the UK and Dr. Corneila Jaspers of Denmark) received a large number of abstract submissions from the scientific community that filled the day-long session, along with a substantial number of posters. They also received commitments from Dr. Reiji Masuda of Japan, Dr. Monty Graham of the U.S., and Dr. Thomas Doyle of Ireland to present as invited speakers.

AGENDA ITEM 4

Fourth International Jellyfish Bloom Symposium

A request was made by the WG Chairs for PICES sponsorship of the Fourth International Jellyfish Bloom Symposium to be held in Hiroshima, Japan, in June 2013. The request was for travel assistance for 1 or 2 invited speakers. It was decided that the WG would hold a one-day inter-sessional meeting in advance of the symposium to take advantage of the expertise coming to the meeting, including present WG members.

AGENDA ITEM 5

WG report outline and brief report on the current status of writing, and coordination of jellyfish sampling techniques

The remainder of the meeting consisted of discussions on the current state of writing for the WG final report. After brief discussions, the WG made slight modifications to the outline of the report adding several new sections that were deemed useful. The major sections of the WG report are as follows: 1) Introduction and purpose, 2) Life history and population dynamics, 3) Sampling considerations, 4) Spatio-temporal variations of biomass and current bloom conditions in regional seas, 5) Physio-ecological properties, 6) Impacts on marine ecosystems and socio-economics, 7) Reducing jellyfish impacts, and 8) Conclusions and prioritized recommendations for future research. WG members were assigned to each of these sections and the status of writing was presented. Discussions were carried out on how this report might best address the goals and themes of the FUTURE program.

AGENDA ITEM 6

Jellyfish sampling techniques

Presentations were made on four different aspects of sampling methodology (trawling, video, acoustics, sonar imaging) used within PICES for assessment of abundance of jellyfish.

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AGENDA ITEM 7

Report on new topics

In a separate but related activity, many of the WG members met with a group of scientists planning to construct ecosystem models for many regions heavily impacted by jellyfish. This project plans to put together holistic ecosystem models for three PICES regions (California Current, Eastern Bering Sea, and ocean off Japan) as well as two non-PICES regions (Gulf of Mexico and Humboldt Current) in the coming years and examine the impact jellyfish have on trophic structure, particularly related to their effect on forage fishes. This work will likely contribute useful information to the management of these ecosystems in the future.

WG 26 Endnote 1

WG 26 participation list

Members

Mary Arai (Canada)
Richard Brodeur (USA, Co-Chairman)
Lucas Brotz (Canada)
Siqing Chen (China)
John Field (USA)
Kyoungsoon Shin (Korea)
Haruto Ishii (Japan)
Jennifer Purcell (USA)
Masaya Toyokawa (Japan)
Shin-ichi Uye (Japan, Co-Chairman)
Zijun Xu (China)
Alexander Zavolokin (Russia)

Observers

Sonia Batten (Canada)
Ik Kyo Chung (Korea)
Ryuji Furukawa (Japan)
Cornelia Jaspers (Denmark)
Martin Lilley (France)
Chris Lynam (UK)
Alenka Malej (Slovenia)
Ryosuke Makabe (Japan)
Chiaki Mizota (Japan)
Yasunori Watanabe (Japan)
Fu Zhilu (China)

WG 26 Endnote 2

WG 26 meeting agenda

1. Opening remarks
2. Introduction of a new member (Masaya Toyokawa, who has replaced the former Japanese member, Hideki Akiyama)
3. Brief report on the preparation of the S7: BIO/FIS Topic Session (1-day) on “*Jellyfish in marine ecosystems and their interactions with fish and fisheries*”
4. Proposal of the involvement of PICES in the Fourth International Jellyfish Bloom Symposium
5. Change in the WG report outline and brief report on the current status of writing
6. Discussion about coordination of jellyfish sampling techniques
7. Brief report on new topics and achievements in jellyfish bloom research in each country
8. Closing remarks

Working Group 27 on *North Pacific Climate Variability and Change*

The 2012 business meeting of the Working Group on *North Pacific Climate Variability and Change* (WG 27) was held October 12, 2012 in Hiroshima, Japan, under the chairmanship of Drs. Shoshiro Minobe (Japan), Emanuele Di Lorenzo (USA), and Michael Foreman (Canada). The meeting was well attended (*WG 27 Endnote 1*) by the members and by two graduate students (Yohei Takano and Andrew Davis) who gave talks at the PICES POC Paper Session and POC-sponsored Topic Session (S3). Unfortunately, Korean and Chinese members did not attend.

AGENDA ITEMS 2 and 3

Meeting agenda and science activities

Most of the meeting time (see *WG 27 Endnote 2*) was spent providing overviews of members' research relevant to the WG 27 terms of reference and to identifying new areas of research and joint activities that are ready for more collaboration among the members. At the end of the discussion three main themes of joint research were isolated:

1. Process modeling of large-scale ecosystem processes

During 2011 and 2012, WG 27 worked to organize large-scale datasets to update the dominant modes of biological variability in the North Pacific (e.g., Dr. Nathan Mantua's talk in Topic Session S3 reported on those efforts). During 2012 we also initiated statistical analyses of the biological dominant modes and their links to climate forcing. We now plan for 2013 to develop process models that enable us to diagnose the temporal variability of the biological dominant biological modes and identify the important large-scale climate forcing functions.

Preliminary discussion with ecosystem scientists also took place to address the issue of how climate forcing may impact bio-geographic distributions important to marine (e.g., fish) populations. Some contact with PICES scientists outside WG 27 provided the basis to initiate new joint research in trying to isolate bio-geographical distribution changes driven by climate forcing. (WG 27 and other PICES members directly involved: S. Minobe, E. Di Lorenzo, J. King, Y. Zuenko, S. Chiba, J. Keister, F. Mueter)

2. Mesoscale eddy dynamics, climate and ecosystems

Another scientific theme that raised significant interest among the members was understanding how climate may impact changes in the mesoscale dynamics and their associated transport processes. As a way forward, the group identified three research priorities: (A) diagnose the large-scale forcing dynamics controlling regional eddy statistics, (B) evaluate changes in the forcing dynamics predicted by IPCC climate models, and (C) link changes in eddy statistics to ecosystem processes. Some WG members showed interesting results on how climate forcing affects changes in mesoscale eddies in the California Current and Gulf of Alaska. (WG 27 members directly involved: E. Di Lorenzo, A. Davis (non-PICES member), B. Taguchi, T. Mochizuki).

3. Controls and mechanics of oxygen variability

Several members of WG 27 are currently working on understanding the dynamics controlling Pacific oxygen variability and its impacts on biogeochemical cycles. After reviewing these results, members of WG 27 will lay out a joint plan for 2013 to undertake the following tasks: (A) understand O₂ statistics by combining observations and ocean models, (B) identify the different scale-dependent regional controls on O₂ variability, and (C) develop process models to hindcast and forecast regional O₂. These activities are likely to lead to high impact scientific results and high profile publications. (WG 27 members directly involved: T. Ito, Y. Takano (non-PICES member), S. Bograd, T. Mochizuki, E. Curchister, S. Minobe and E. Di Lorenzo)

AGENDA ITEM 4

Developing synergies between PICES and CLIVAR

In the current CLIVAR Science Plan, one of the major four programs supervised by WCRP (World Climate Research Programme), which will end in 2013, is devoted to physical climate variability including the ocean. Thus, CLIVAR's focus on the ocean is mostly limited to what can be important in the atmosphere, leading to most of CLIVAR endorsed programs in the tropics and ignoring a number of processes important in marine ecosystem and biogeochemical cycles.

The new CLIVAR has been asked by WCRP to collaborate on research on green oceanography, especially with IMBER. WG 27 Co-Chair, Dr. Minobe, FUTURE's AP-COVE Chair, Dr. Hiroaki Saito, and Dr. Toshio Suga attended the 7th CLIVAR Pacific Panel meeting, April 28–29 in Noumea, New Caledonia. At this meeting they proposed that new CLIVAR should widen its scope to include marine biophysical interactions. The essence of this proposal was transferred to joint CLIVAR SSG-IMBER SSC meeting on June 13, La Paz, Mexico. The proposition was well received and the new CLIVAR Science Plan draft mentions Marine Biophysical Interactions and Dynamics of Upwelling Systems. Of course, inclusion of this is not solely due to our efforts, but the fact that the schematics produced by Dr. Minobe is used by CLIVAR SSG Co-chair, Martin Visbeck, for WCRP JSC-33 Beijing, China, in 18 July 2012, indicates that our proposal played a role.

Collaboration with CLIVAR still poses some issues because the CLIVAR Pacific Panel has been working on the tropical Pacific with a little spatial overlap with the primary region of interest to PICES. Thus, further continuous efforts from PICES are necessary. For the next step, we propose to have a joint workshop between PICES and CLIVAR Pacific Panel, with travel support for two PICES members to the workshop.

2013 CLIVAR/PICES joint workshop

The details of the workshop [later developed as a theme session on “*Biophysical interactions*” Dr. Shoshiro Minobe (Japan) as a PICES Convenor] will be held at an international symposium on “*Boundary Current dynamics: Its connection with open-ocean, coastal processes, biophysical interactions and responses to global climate change*”, July 8–13, 2013, in Li Jiang, China. The following topic questions will include: What roles do western boundary currents play in biogeochemical cycles and marine ecosystems? What processes are important? How variability and change of the western boundary current influence the biogeochemical cycles and marine ecosystems. PICES endorsed the proposal and the joint session is currently being organized.

AGENDA ITEM 5

2012 ECOFOR Workshop

A jointly sponsored GLOBEC/PICES/ICES Workshop on “*Forecasting ecosystem indicators with process-based models*” (ECOFOR) took place in Friday Harbor (WA) on September 9–12, 2012. The ECOFOR workshop was attended by 28 climate and marine ecosystem scientists. The discussions were very energetic with rich scientific exchanges.

The goal of the workshop and the activities that are following within WG 27 is to move beyond the simple correlation analyses between physical and biological variability, and to identify key processes that enable us to succinctly and quantifiably model the mechanisms underlying the relationships observed in physical-biological datasets, both in the North Pacific and North Atlantic. The process models developed for this goal include as few degrees of freedom as possible (not full complexity) to sufficiently capture and test specific mechanisms of the ecosystem response to climate forcing and of the internal population dynamics. The process models are developed and tested within statistically based frameworks (*e.g.*, Bayesian hierarchical models, linear inverse models, *etc.*) that allow formal quantification of the uncertainties in historical reconstructions and future predictions of targeted ecosystem variables. Ten examples of diagnostic and predictive ecosystem process models of different degrees of complexity were presented and discussed at the workshop, and are available in the workshop report and website <http://wg27.pices.int/ecofor>.

These types of ecosystem process models complement full-ecosystem complex models (e.g., End-To-End, Atlantis, ROMS-NPZD-NEMURO, IBM) by (1) directly testing the understanding and (2) quantifying the role of specific mechanisms underlying the physical-biological linkages. Although process models by definition do not include a complete description of ecosystem function and cannot account for the multi-dimensional interactions, they avoid magnifying uncertainty stemming from processes that are not well understood and modeled in full-ecosystem complex models.

Developing hindcast and forecast ecosystem process-based models

The goals here are to: (1) maintain and improve the collaboration and exchange between marine ecosystem scientists, physical oceanographers, and climate scientists. This dialog is the foundation for developing better and new hypotheses linking ecosystem response to climate forcing. (2) Identify and develop targeted observational and modeling datasets that are required to test the new hypotheses using the process models.

Recommendations to PICES and ICES

Discussions at the workshop led to the following recommendations:

1. *ECOFOR II*. Most of the workshop participants felt that there was a need for more time to continue the discussion. All the participants supported the idea of holding a second workshop, ECOFOR II, in 2013. Given that promoting and continuing this interdisciplinary exchange has been identified as one of the priorities in the executive summary of this workshop, and is most relevant to the activities of PICES and ICES, we recommend the two organizations support ECOFOR II through PICES WG 27 (within PICES) and by extending the mandate of WKECOFOR (within ICES).

2. *PICES Workshop 2013 and ICES Theme Session*. In order to support the main priorities isolated in the executive summary, WG 27 recommended to support an ICES theme session and a PICES workshop proposal (*WG 27 Endnote 3*) to be held at the ICES Annual Science Conference and PICES Annual Meeting in 2013, respectively, and both entitled: “*Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for the future*”.

This workshop addresses directly the terms of references of WG 27 (ToRs: 2, 3, 4, 6, 7, and 8; <http://wg27.pices.int/tors.html>) and ICES-WKECOFOR, and builds on the results from the co-sponsored GLOBEC/PICES/ICES workshop on “*Forecasting ecosystem indicators with process-based models*” (<http://wg27.pices.int/ecofor>) held at Friday Harbor Labs in September 2012.

These two proposals were submitted and both were accepted. They have the same focus and title in order to be able to collect inputs from both the PICES and ICES scientists on this topic.

3. *Climate forcing indicators repository*. A major challenge towards developing and testing new hypotheses of the physical-biological linkages is the need to (1) identify/develop targeted observational and modeling datasets that can be used with process models and (2) better understand the regional physical forcing dynamics associated with the large-scale climate variability and change. To this end we recommend the development of a web-based repository of relevant climate forcing indices (from observations and models) along with a comprehensive explanation of their regional impacts and dynamics. This activity is already ongoing within PICES WG 27 but may also be considered within ICES for the activities of the new joint ICES/PICES Strategic Initiative on Climate Change and Marine Ecosystems (SICCME; in PICES, it is referred to as a Section (S-CCME).

ECOFOR website, publications and PICES Press newsletter

All the material and documents of the ECOFOR workshop have been organized on the workshop website <http://wg27.pices.int/ecofor/>. The website also contains the presentation files and summary for each of the presenters. The website is hosted on the PICES WG 27 website (<http://wg27.pices.int>). We plan to keep the

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ECOFOR website active and updated while we continue to engage in the post-workshop activities outlined below. A publication of the [workshop summary](#) can be found in PICES Press (2013, Vol. 21, No. 1) newsletter.

AGENDA ITEM 6

Review of Terms of Reference

1. Summarize the current understanding of mechanisms of Pacific climate variability and change, and evaluate the strengths of the underlying hypotheses with supporting evidence. (Members involved: Di Lorenzo, Taguchi, Ustinova, Minobe)
2. Develop conceptual frameworks and low-order models of North Pacific climate variability and change, which can be used by climate researchers to investigate the mechanisms of those variations and by ecosystem scientists to explore hypotheses linking ecosystem dynamics and physical climate. (Members involved: Xiaopei Lin, Soon Il, Sang-Wook, Di Lorenzo, Minobe)
3. In conjunction with ecosystem scientists, coordinate the development and implementation of process-based models, which include important processes in simple forms, to hindcast the variability of available long-term biological time series. (Members involved: Foreman, Guimei, Bograd, Ito, (Hollowed), Di Lorenzo, Curchister)
4. Develop a method to identify and provide uncertainty estimates of decadal variability in recent historical climate and ecosystem time series. (Members involved: Minobe)
5. Provide improved metrics to test the mechanisms of climate variability and change in IPCC models, and in coordination with other PICES working groups and FUTURE Advisory Panels, assist in evaluating those models and providing regional climate forecasts over the North Pacific. (Members involved: Di Lorenzo, Yeh, Jang, Guimei, Pavlova, Bograd, Mochizuki)
6. Understand and fill the gaps between what physical models can currently produce and what ecosystem scientists suggest are the important physical forcing factors required for predicting species and ecosystem responses to climate variability and change. (Members involved: Foreman, Guimei, Bograd, Ito, (Hollowed), Di Lorenzo, Curchitser)
7. Maintain linkages with, and summarize the results from National and International programs/projects such as CLIVAR, IMBER, US CAMEO, ESSAS, Japanese Hot Spot in the Climate System, POMAL, CREAMS EAST-I, POBEX, and others. (Most members are heavily involved in these organizations)
8. Convene workshops and sessions to evaluate and compare results and maintain an awareness of state-of-the-art advances outside the PICES community.
9. Publish a final report summarizing results.

WG-27 Endnote 1**WG 27 participation list**Members

Steven Bograd (USA)
 Patrick Cummins (Canada)
 Enrique Curchitser (USA)
 Emanuele Di Lorenzo (USA, Co-Chairman)
 Michael Foreman (Canada, Co-Chairman)
 Shin-ichi Ito (Japan)
 Taka Ito (USA)
 Jacquelynn King (Canada)
 Takashi Mochizuki (Japan)
 Shoshiro Minobe (Japan, Co-Chairman)
 Bunmei Taguchi (Japan)
 Elena Ustinova (Russia)
 Yury Zuenko (Russia)

WG-27 Endnote 2**WG 27 meeting agenda**

1. Welcome and introductions
2. Meeting agenda
3. Science activities
4. Developing synergies between PICES and CLIVAR
5. 2012 ECOFOR Workshop
6. Review of Terms of Reference

WG-27 Endnote 3

Proposal for 1-day Workshop on “Identifying mechanisms linking physical climate and ecosystem change: Observed indices, hypothesized processes, and “data dreams” for the future” at PICES-2013

Climate variability and change in the ocean is now recognized as a significant driver of marine ecosystem response, from primary production to zooplankton composition, and through the trophic chain to fish, marine mammals and other top predators. Past studies have often relied upon existing datasets to draw correlative conclusions (associated with indices and discovered time-lags in the system) regarding the possible mechanisms that may control these linkages. In this workshop, we seek to identify and model key processes that enable us to succinctly and quantifiably explain the mechanisms underlying the correlative relationships in physical-biological datasets, both in the North Pacific and North Atlantic. The description and modeling of these key processes may (a) involve few or several variables (but not full complexity), (b) use dynamical (e.g. eddy-resolving ocean models, NPZ, IBM, etc.) or statistically based methods (e.g. Bayesian, linear inverse models, etc.), (c) explain variability in low or high tropic levels (although we seek to emphasize secondary and higher producers), and (d) include uncertainty estimation. We also solicit ideas and hypotheses concerning new mechanisms of physical-biological linkages that can only be tested by establishing novel long-term observational strategies, where the harvest of understanding will eventually be reaped by future generations of ocean scientists, as well as by developing creative modeling datasets, where ecosystem complexities can be effectively unraveled. The workshop format will be a mixture of talks and group discussions that aim at enriching the exchange of ideas and concepts between physical and biological

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ocean scientists. The ultimate goal is to deliver (1) a set of new hypotheses of the mechanisms of marine ecosystem response to climate forcing, and (2) a description of the observational and modeling datasets required to test these hypotheses using process models.

Sponsoring Committees/Program: POC/BIO/MONITOR/FUTURE

Co-conveners: Emanuele Di Lorenzo (COVE-AP/WG 27; USA), Arthur Miller (USA), Ryan Rykaczewski (USA), Shoshiro Minobe (WG 27; Japan), Kazuaki Takadoro (Japan), Jacquelynne King (WG 27; Canada), Marc Hufnagl (ICES, Germany)

Invited Speakers: Jürgen Alheit (Germany) and Carolina Parada (Chile)

Working Group 28 on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors*

The Working Group met from 9:00 to 17:00 on October 13, 2012 at the International Conference Center, Hiroshima, Japan. The main objective of the meeting was to review activities during the first year of WG-28 and discuss the methodologies and outcomes for characterizing critical stressors and indentifying locations where multiple stressors interact in North Pacific ecosystems. Participants at this meeting are identified in *WG 28 Endnote 1* and the agenda for the meeting can be found in *WG 28 Endnote 2*.

AGENDA ITEM 2

Review of activities during the first year

Terms of Reference

The Terms of Reference (*WG 28 Endnote 3*) were reviewed and discussed. It was recognized that they are very ambitious, each of which could be an entire research project on their own. However, the WG felt that progress made on any of the Terms of Reference would be an important contribution to PICES and its FUTURE program.

Report on PICES-2012 Workshop W1

Co-convenors, Drs. Jennifer Boldt and Jameal Samhour, of PICES Workshop W1 on “*Identifying critical multiple stressors of North Pacific marine ecosystems and indicators to assess their impacts*” presented their report (see Session Summaries elsewhere in the PICES-2012 annual report). Seven papers were presented. Three types of approaches were proposed: (1) expert-based surveys, (2) model-based analyses, and (3) empirical/data based analyses, although it was recognized that the boundaries between the approaches are fuzzy and often more than one approach is used. High level advantages and disadvantages of each of these approaches were identified. Tables were developed to assess the general availability of data in four categories to develop indices of multiple stressors on marine system. These categories were environmental, biological, human activities and stressors, and social-political-economic indicators. The purpose was to identify information gaps, and which categories have similar or different levels of information available in each of the PICES member countries (Do they data exist? Are time series available? and What is the extent of spatial coverage?). The concept for these tables is similar to that used by WG 19 on *Ecosystem-based management science and its Application to the North Pacific* which developed a table to assess the information potentially available in each PICES member country for ecosystem indicators (*PICES Scientific Report 37, Chapter 3, Table 3.1.3*).

WG 28 expressed its appreciation to the Convenors for an excellent session.

Action: Korean and Chinese members of the Working Group are asked to complete the tables for their countries.

Report on PICES-2012 Topic Session S10

Co-convenors, Drs. Vladimir Kulik, Ian Perry, and Motomitsu Takahashi, gave a short presentation on the general contents and expected outcomes from Topic Session S10, “*Ecosystem responses to multiple stressors in the North Pacific*”, which was held later in the week, on Friday 19, October. This session was co-sponsored by SOLAS (Surface Ocean – Lower Atmosphere Study), a core program of the International Geosphere-Biosphere Program (IGBP). See the Session Summaries section of the PICES-2012 annual report for a complete description of the Topic Session.

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National Reports on related activities

WG 28 members provided brief reports on additional activities in their countries relevant to the work of WG 28.

Canada: Dr. Perry made a short presentation on the work by DFO Pacific Region to develop a risk-based assessment framework to identify priorities for ecosystem-based oceans management in the Pacific Region. The work is based on a recent report (DFO 2012. Risk-based Assessment Framework to Identify Priorities for Ecosystem-based Oceans Management in the Pacific Region. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/044. Available at

http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2012/2012_044-eng.html). It develops an ecological risk assessment framework (ERAF) to support the identification of risks and threats to Valued Ecosystem Components (VECs). It is suitable for identifying and assessing relative risks of harm to VECs from human activities and their associated stressors, and for ranking the significance of activities and stressors based on the relative risks to VECs in support of ecosystem-based management. In addition, a Driver-Pressure-State-Impact-Response (DPSIR) model can be used to identify priority drivers and pressures.

Korea: Dr. Ik Kyo Chung presented a brief overview of the IFRAME concept as developed by Dr. Zhang (Zhang *et al.* 2010, *Fisheries Research*; Zhang *et al.* 2011, *ICES J. Mar Sci.*).

USA: Dr. Samhuri suggested that NOAA's Integrated Ecosystem Assessment activities for the California Current could be leveraged for WG 28 purposes. These activities include recent efforts to compile time series for drivers and pressures (which are good for characterizing the temporal extents of stressors) and a paper which integrates expert opinion with empirical data to evaluate risk to habitats. In collaboration with Stanford University and NCEAS at UC Santa Barbara, Dr. Samhuri is also part of a new project, focused on identifying thresholds for marine spatial planning (<http://thresholds.nceas.ucsb.edu/static/Welcome.html>), which may bear some relevance to WG 28 activities.

AGENDA ITEM 3

Methodologies to address the Terms of Reference (WG 28 Endnote 3)

Framework for identifying multiple interacting stressors and their trends

WG 28 developed an applied web-based questionnaire regarding expert opinions on habitats which may be vulnerable to multiple stressors. For each question, respondents were asked to identify how certain they are of their estimates: 1: very low (<15%); 2: low (15–50%); 3: high (50–85%); 4: very high (>85%).

- *Spatial Extent:* spatial scale at which a single event of the activity/stressor impacts this habitat. Values were scored as 1 = <10 km²; 2 = 10–100 km²; 3 = 100–1000 km²; 4 = >1000 km².
- *Frequency:* average annual frequency at which the activity/stressor occurs at a particular location in this habitat. Values were scored as 1 = rare, *e.g.* once every >5 yrs; 2 = occasional, *e.g.* once every >1–5 yrs; 3 = seasonal, *e.g.* every season to once a year; 4 = persistent, *e.g.* daily or continual.
- *Trophic impact:* primary level affected by the activity/stressor within the habitat. Values were scored as 1 = species (single or multiple); 2 = single trophic level; 3 = >1 trophic level; 4 = entire community.
- *Resistance to change:* degree to which the species, trophic level(s), or entire habitat's "natural" state is impacted by the activity/stressor, *i.e.*, how good is the resistance of this habitat to change caused by this activity/stressor. Values were scored as 1 = activity/stressor has a positive impact; 2 = high resistance to change (*i.e.* little significant negative change in biomass); 3 = moderate resistance to negative change; 4 = low resistance to negative change (*i.e.* significant negative biomass changes result from small stresses).

- *Recovery time*: average time required for the affected species, trophic level(s), or entire community to return to its “natural” state following disturbance by this activity/stressor. Values were scored as: 1 = <1 year; 2 = 1–10 years; 3 = 10–100 years; 4 = >100 years.

This survey of experts to identify habitats, stressors, and the vulnerability of habitats to each stressor was discussed:

Canada: The survey was distributed to over 50 experts; the geographic focus was the Strait of Georgia. The response rate was rather low, with some respondents replying that the survey was too difficult and they felt they did not have the expertise to respond to habitats and stressors beyond the research areas. Other respondents replied that the survey was too simplistic and could not possibly capture what is really going on. Dr. Perry presented the results in Topic Session S10.

China: no information was obtained from China yet, but Dr. Takahashi received some responses from some Chinese experts and will follow up on this.

Japan: Dr. Takahashi provided a brief overview of his presentation for Topic Session S10, reviewing the survey results for Japanese waters. He focused on the survey results from the Seto Inland Sea, in which coastal development has reduced the natural shore lines (majority of effects are artificial and semi-natural) and decreased tidal flat and sea grass beds due to coastal development. Problems for scoring encountered in survey: evaluation of impacts could be different among experts with different expertise; certainty of impacts are different among ecosystems due to quality and quantity of information. For the East China Sea, more information on intertidal and coastal waters along China are needed.

Korea: Dr. Chung did the survey with his students, and they found it difficult. He suggested conducting a preliminary review of information and then reducing the list and sending it out to survey participants. He commented that there is a lot of activity in member countries, and it was important to collate that information and not re-invent the wheel.

Russia: Dr. Kulik described that Dr. Olga Lukyanova does research on small spatial scales and human activities/stressors on ecosystems, which is regulated by government standards. Dr. Kulik’s research is on a broader spatial scale. Ecosystem status; surveys sampled all the fish caught by trawl with 1 cm mesh, targeting mainly to estimate commercially important species, and the project to estimate energy flows in ecosystems through carbon (C/N) and nutrients among species moved to a new stage this year. Geographic and temporal (seasonal) variation will be taken into account. He noted that environmental information including water property profiles (T, S and sometimes acidity, pH, alkalinity, phosphate, silicate, nitrite, nitrate and DO), zooplankton composition and stomach contents almost at every trawling station are available, but at the first stage of extracting environmental pattern fluctuations, more frequent and regular time series such as SST and sea ice were chosen. Human information has been estimated through ship tracks taking into account maximum power of each vessel and type of trawling (is it bottom trawling or not?) through the area since 2003.

USA (Washington): Dr. Samhuri made a presentation at Workshop W1 on his results from the survey sent to experts on Puget Sound. He is restricted to sending the survey to federal employees only, but distributed the survey to ~45 of them.

USA (Alaska): Dr. Patricia Livingston attended the WG meeting on behalf of Dr. Stephani Zador. She described the Ecosystem Considerations document that is developed each year to accompany their stock assessment advice reports. They developed a team-based approach to derive a focused set of indicators and to provide ecosystem-specific assessments with state information. The main conclusions are: 1. the physiological and biological nature of the ecosystem, the extent of scientific knowledge about the ecosystem, and the particular expertise of team members will influence the final assessment product; 2. team discussion of assessment structuring themes should occur before indicator selection, and 3. developing assessments should be an iterative process with frequent review by fisheries managers. Some experts have expertise in only some areas; could target expert opinion in particular habitats.

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WG 28 participants went over the scoring for the survey. Did the metrics work well? It can be difficult for experts to simplify things to fill out the survey. Some people did not want to do the survey because they did not have expertise on all things; others who know a lot about the ecosystem had difficulty because they know too much – *i.e.*, it can be difficult for experts to think generally. However, the value of this type of survey is having many people respond to the survey (provides an idea of consensus). In addition, the conclusions drawn from the responses can be verified in situations where empirical data exist. For the survey, respondents were asked to provide an estimate of their certainty for each question. These results can be used to identify components of vulnerability of habitats to stressors where information and understanding is lacking. For example, in the Canadian survey it appears that resistance to change and recovery time was usually scored with lower certainty than the other three components.

There was a long discussion on how to combine scores, and in particular how to include the certainty estimates for each component. For example, add them up or weight the responses based on their certainties estimates? In general, the goal is to produce a scaling in which a larger number represents a stronger impact. Dr. Perry proposed re-scaling the certainty scores, for example:

		Low certainty	High certainty
		Certainty scores 1 or 2	Certainty scores 3 or 4
Low impact	Certainty scores 1 or 2	2	1
High impact	Certainty scores 3 or 4	1	2

These weightings would then be multiplied by the scores for each vulnerability component, and then summed to derive the overall vulnerability score for that habitat to that stressor.

Dr. Samhuri proposed weighting the certainty values and multiplying them by the impact score. Alternatively, responses for which uncertainty >50% (*i.e.*, certainty <50%), could be deleted. In Alaska, Dr. Zador asked for uncertainties for each entry, which were then entered as a decimal. For example: enter 1–4 according to the definition (column B) for each vulnerability (x) AND include the decimal value in each cell corresponding to how certain you are of this value:

- (x.1) best guess,
- (x.2) some evidence of interaction from other systems,
- (x.3) some evidence of interaction from this system,
- (x.4) evidence of interaction from this specific habitat in this system (*e.g.*, published paper).

If there is no interaction, just leave the cell blank. For example: a value of 3.2 would represent moderate certainty seasonal changes in freshwater flow affect intertidal mud habitats based on studies from other systems.

Another suggestion was to use a certainty score of 0 and 1; however, it was pointed out that a score of 0 would eliminate too much information and having more than 2 scores provides more information.

In conclusion to this agenda item, it was suggested to examine different methods for this, and consider performing a sensitivity analysis on different weighting scenarios. The goal would be to recommend a common method for all members of WG 28 to use. It was also noted that the Teck *et al.* paper (*Ecological Applications* 20(5): 1402–1416, 2010) suggests that vulnerability is better represented by the resistance to change and the trophic level components.

Action: Drs. Samhuri and Perry to explore options for dealing with the certainty values.

Potential indicators for these stressors and interactions, and how they relate to ecosystem responses and identification of vulnerable ecosystem components

The Working Group discussed whether ecosystem indicators for multiple and interacting stressors would be any different from those developed for single stressors, such as fishing.

It was noted that the ‘management class’ of ecosystem indicators perhaps depends on the objectives constructed for those indicators more so than the type of stressor that is present. For example, say that indicators are relevant to objectives and the indicators will change for the objectives. However, knowing which stressors are causing ecosystems to respond is important for understanding how and why the ecosystem is changing. The indicators developed from the IndiSeas (www.indiseas.org) and the Alaska Ecosystems Considerations chapter may provide good starting points for baseline indicator sets that could be examined to determine if they need to be expanded to address issues of multiple stressors. Another suggestion was to develop indicators of ecosystem responses, followed by how stressors are changing, and then conduct correlative type analyses to relate the two sets of time series.

It was recommended that this topic be given further thought and be a main item for discussion at the Working Group meeting next year.

AGENDA ITEM 4

Discussion on draft Table of Contents and outline for the WG 28 final report

A draft Table of Contents (*WG 28 Endnote 4*) for the final report of WG 28 was reviewed and modified, and proposed chapter leads were identified. It was recommended to consider the use of a web-based platform (*e.g.*, Google docs) to access and track edits and version changes to the evolving chapters. Alternatively, a private page on the PICES website could be requested for the Working Group. The Group chose to leave it to the discretion of each set of chapter authors as to how they wish to handle their writing process. In addition, it was agreed that the delivery date for the Working Group could be no earlier than 2014 (which is the expected due date to the parent BIO and MEQ committees), but could possibly need to be extended to 2015.

Action:

- Chapter leads and contributing authors (*see WG 28 Endnote 4*) are to develop outlines for their chapters and detailed contents (for those chapters where this is possible) over the next year, and have ready for discussion at the next meeting.
- Working Group Chairs to notify the parent Committees about the anticipated delivery dates for the WG 28 final report.

AGENDA ITEM 5

Discussion of interactions with other PICES groups

Working Group members anticipate interactions with the following PICES groups:

- Section on *Climate Change Effects on Marine Ecosystems*
- MAFF-funded project on marine ecosystems and human well-being
- Section on *Human Dimensions of Marine Systems*
- Any expert groups working on harmful algal blooms or invasive species
- MONITOR Committee, re: environmental indicators

Interactions with other PICES groups are also welcome.

AGENDA ITEM 6

Topic Session at PICES-2013

A proposal for a Topic Session at the next PICES Annual Meeting was submitted through a new on-line submission system to the PICES website (*WG 28 Endnote 5*). The Working Group felt this was a very ambitious topic, but appropriate for this Working Group to begin to address. Suggestions for possible invited speakers include: Marten Scheffer (The Netherlands), Steve Carpenter (USA), an expert from the IndiSeas program, Shinsuke Tanabe (CMES, Ehime University, Japan) – eco-toxicologist, and Isabel Coté (Canada) or her student Emily Darling.

WG 28-2012

The next meeting of the Working Group is expected at PICES-2013 to be held in Nanaimo, Canada.

AGENDA ITEM 7

Adjourn

The meeting adjourned at 1700 h, followed by a sake sampling and yakitori dinner party.

WG 28 Endnote 1

WG 28 meeting participation list

Members

Jennifer L. Boldt (Canada)
Ik Kyo Chung (Korea)
Sachihiko Itoh (Japan)
Vladimir V. Kulik (Russia)
Ian Perry (Canada, Co-Chairman)
Jameal Samhouri (USA)
Motomitsu Takahashi (Japan, Co-Chairman)
Naoki Yoshie (Japan)
Stephani Zador (by WebEx for the first half of the meeting)

Observers

Christopher Aura (Japan)
Karin Baba (Japan)
Natalie Ban (Australia)
Yoichiro Ishibashi (Japan)
Patricia Livingston (USA)
Kazuhiro Mochida (Japan)
Masakatsu Ohyama (Japan)
Takafumi Yoshida (Japan)
Hiroaki Saito (Japan)



WG 28 meeting participants at PICES-2012 in Hiroshima, Japan. Left to right: Motomitsu Takahashi, Hiroaki Saito, Sachihiko Itoh, Takafumi Yoshida, Christopher Aura, Naoki Yoshie, Jameal Samhouri, Natalie Ban, Yoichiro Ishibashi, Patricia Livingston, Karin Baba, Jennifer Boldt, Ik Kyo Chung, Vladimir Kulik, Ian Perry.

WG 28 Endnote 2**WG 28 meeting agenda**

1. Welcome, Introduction and sign-in (all)
2. Review of activities during the 1st year of WG-28
 - a) General review of Terms of Reference
 - b) Report on outcomes of Workshop W1
 - c) Report on Topic Session S10
 - d) Report on additional related activities from each PICES country
3. Discuss methodologies to address the Terms of Reference
 - a) Framework for identify multiple interacting stressors and their trends (e.g. session S10)
 - b) Potential indicators for these stressors and interactions, and how they relate to ecosystem responses and identification of vulnerable ecosystem components (e.g. W1)
4. Discussion on draft Table of Contents, outline for the WG28 final report, and assignment of tasks: begin developing the outline for the final report, discuss the general contents of each chapter, and who will take the lead on each chapter.
5. Discussion of interactions with other PICES groups
 - a) Relationships between WG28 and other Working Groups and Committees
 - b) Contributions to FUTURE
6. Discussion on Topic Session at PICES-2013
 - a) Review of a topic session proposal
 - b) Other related issues
7. Adjourn

WG 28 Endnote 3**Terms of Reference**

1. Identify and characterize the spatial (and temporal) extent of critical stressors in North Pacific ecosystems both coastal and offshore and identify locations where multiple stressors interact. Identify trends in these stressors if possible.
2. Review and identify categories of indicators needed to document status and trends of ecosystem change at the most appropriate spatial scale (e.g., coastal, regional, basin).
3. Using criteria agreed to at the 2011 PICES FUTURE Inter-sessional Workshop in Honolulu, determine the most appropriate weighting for indicators used for:
 - a. documenting status and trends
 - b. documenting extent of critical stressors
 - c. assessing ecosystem impacts/change
4. Review existing frameworks to link stressors to impacts/change, assessing their applicability to North Pacific ecosystems and identify the most appropriate for application to North Pacific ecosystems.
5. Determine if ecosystem indicators provide a mechanistic understanding of how ecosystems respond to multiple stressors and evaluate the potential to identify vulnerable ecosystem components.
6. For 1-2 case studies, identify and characterize how ecosystems respond to multiple stressors using indicators identified above. Are responses to stressors simply linear or are changes non-linear such that small additional stressors result in much larger ecosystem responses? Do different parts of the ecosystem respond differently (e.g., trophic level responses)? How do stressors interact?
7. Publish a final report summarizing results with special attention to FUTURE needs. This WG will focus primarily on delivery of FUTURE Questions 3 and 1 (outlined below).

Linkages to the FUTURE Science Plan:

1. What determines an ecosystem's intrinsic resilience and vulnerability to natural and anthropogenic forcing?
2. How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future?
3. How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems?

WG 28 Endnote 4

DRAFT Final Report Table of Contents

(Note: all WG members are expected to contribute to each main chapter; names listed are those who will likely take the leads for each chapter)

1. Introduction (Co-Chairs)
 - background to WG 28
 - Terms of Reference / Objectives
 - brief overview of the issue of multiple activities/stressors on marine ecosystems:
 - e.g., use of the phrase “activities/stressors (or “pressures”) to indicate both natural and anthropogenic pressures, and that not all of these are always “bad” for the ecosystem,
 - include definitions for “stressors”, issue that information to construct indicators is often available at multiple but different time and space scales, *etc.*
 2. Frameworks linking pressures to impacts and changes in North Pacific marine ecosystems (Perry, Takahashi, Samhouri, Zhang, Lee)
 - brief review of potential frameworks that could be used to link activities and stressors to ecosystem responses,
 - assessment of their applicability to North Pacific marine ecosystems,
 - recommendations for applications,
 - e.g., Pathways of Effects and Driver-Pressure-States-Impact-Response models; simulation and other analytical modeling approaches, e.g. Ecopath with Ecosim, probabilistic (Bayesian) networks; Integrated Ecosystem Analyses; IFRAME, others?
 - addresses ToR 4.
- Multiple pressures on North Pacific marine ecosystems
- identification of the spatial (and temporal, if available) extent of important activities and stressors in North Pacific marine ecosystems,
 - identify habitats and general locations (if possible) where multiple stressors overlap,
 - identify trends in these activities/stressors if possible,
 - sub-sections of this chapter for each PICES country, preferably using a common approach, plus a synthesis section,
 - e.g., PICES Topic Session S10 at 2012 Annual Meeting (Hiroshima),
 - addresses ToR 1.
3. Ecosystem indicators (Boldt, Ito?, Samhouri, Yoshie, Kulik, Chung – re filing W1 tables)
 - brief review of indicators proposed in the literature to document status and trends of ecosystem conditions,
 - present criteria proposed for the selection of indicators, e.g., Rice and Rochet (2005. *ICES J. Mar. Sci.* 62: 516–527), PICES-2011 FUTURE Workshop,
 - focus in particular on indicators relevant for assessing multiple pressures,
 - addresses ToR 2 and 3.

Indicators for ecosystem responses to multiple pressures

- identify ecosystem indicators which might be used to provide an understanding of how ecosystems respond to multiple stressors
- (could use case studies to provide mechanistic understanding where these are known)
- evaluate their potential to identify vulnerable ecosystem components
- e.g., PICES Workshop W1 at 2012 Annual Meeting (Hiroshima)
- Include tables produced in W1 regarding available data
- addresses ToR 5

4. Case study examples (or embed in above chapters??) (Samhouri, Perry, Boldt, Takahashi, Itakura?)

- which areas:
 - Salish Sea (Strait of Georgia; Puget Sound),
 - Seto Inland Sea,
 - Possibly: Sea of Okhotsk, Bering Sea (?Lukyanova, Kulik, Zador?)

5. Conclusions and recommendations (Co-Chairs)

Appendices

1. Terms of Reference
 2. Membership
 3. Reports of sessions held by WG28
- etc.*

WG 28 Endnote 5**Proposal for a 1-day Topic Session on “Ecosystem indicators to characterize ecosystem responses to multiple stressors in North Pacific marine ecosystems” at PICES-2013**

Multiple natural and human stressors on marine ecosystems are common throughout the North Pacific, and may act synergistically to change ecosystem structure, function and dynamics in unexpected ways that can differ from responses to single stressors. Further, these stressors can be expected to vary by region, and over time. Understanding the impacts of multiple stressors, and developing indicators which capture their behaviours and changes, are major challenges for an ecosystem approach to the North Pacific and for the PICES FUTURE project. The objective of this session is to present potential indicators of ecosystem responses to multiple stressors in the North Pacific (with the focus on multiple, rather than single, stressors). One goal of the session is to determine if these proposed ecosystem indicators provide a mechanistic understanding of how ecosystems respond to multiple stressors and to evaluate their potential to identify vulnerable ecosystem components. For example, 1) are responses to stressors simply linear or are changes non-linear such that small additional stressors result in much larger ecosystem responses; 2) do different parts of the ecosystem respond differently (e.g., trophic level responses); 3) how do stressors interact and can these interactions be adequately captured by the proposed indicators? Both empirical and model-based analyses are welcome. This session will provide input to Working Group 28 on ecosystem indicators for multiple stressors on the North Pacific, and will feature progress and presentations from within and outside of this Working Group.

Sponsoring Committee/Program: BIO/FIS/MEQ/TCODE/FUTURE

Co-convenors: Ian Perry (Canada), Vladimir Kulik (Russia), Chaolun Li (China), Jameal Samhouri (USA), Motomitsu Takahashi (Japan), Chang-Ik Zhang (Korea)

Working Group 29 on *Regional Climate Modeling*

The first business meeting of Working Group (WG 29) on *Regional Climate Modeling* (RCM) was held in Hiroshima, Japan on October 13, 2012 during the PICES Annual Meeting. With 16 members and observers in attendance (*WG29 Endnote 1*), the agenda (*WG29 Endnote 2*) included an introduction to the objectives of WG29 by Co-Chairman, Dr. Enrique Curchitser. Co-Chairman, Dr. Chan Joo Jang, gave a brief overview of national activities in *Regional Climate Modeling* (RCM). After short presentations by Working Group members, discussion moved to emerging issues in RCM, plans and schedule of future activity.

AGENDA ITEM 2

Overview of national RCM activities

Dr. Curchitser described the motivation for WG29, including its terms of reference (TOR; *WG 29 Endnote 3*), future schedule and plans. Dr. Jang gave a short presentation showing each PICES member country's RCM information (model domain, grid size, *etc.*) based on responses to a questionnaire distributed to WG29 members prior to the Hiroshima meeting.

AGENDA ITEM 3

Presentations on topics relevant to terms of reference

As the main agenda item of the meeting, participating members described their research activities that are relevant to the TOR.

Michael Foreman: *An update on the IOS Regional Climate Model for the British Columbia (BC) continental shelf*

Dr. Foreman described the development and preliminary results of an RCM (ocean only) for the BC continental shelf. Future forcing and initial field anomalies were computed from the NARCCAP CRCM/CGCM fields. Runs were done with combinations of future and contemporary forcings to understand the nature of changes. Future plans include the following:

- To develop projections using other NARCCAP AR4 RCM combinations and AR5 RCM anomalies;
- To update an NPZD-type ecosystem model to include cycling of several biogeochemical elements (N, C, Si(OH)₄ and O₂), two types of phytoplankton and of zooplankton, multiple limiting nutrients, dynamic chlorophyll compartments, and temperature dependence of physiological rates;
- To couple the NPZD and marine geochemical ecosystem model (Angelica Peña);
- Boundary Conditions for ecosystem projections will be based on nutrients only (not plankton).

Kyung-Il Chang: *Ocean climate change: Analyses, projection, adaptation*

Prof. Chang described RCM activities focusing on future projection for seas around Korea. Better surface boundary conditions are essential for RCM projections: present climate + climate change mode. The plan is to extract climate change modes from global simulations and use these to force RCM models. Cyclostationary EOF analysis was used to identify the modes. Projections will be made for marginal seas for 2100 based on A1B and RCP4.5. The projected SST changes in marginal seas around Korea show more warming in the northern region.

Andrei Krovnin: *Introductory presentation of the INM Ocean Model (INMOM)*

Dr. Krovnin provided a short description of INMOM and numerical simulation results for the Japan/East Sea and North Pacific Ocean. INMOM uses a sigma-coordinate system with primitive governing equations. Numerical simulations of the Japan/East Sea and North Pacific Ocean circulations are performed by using INMOM and real atmospheric forcing CORE and ERA-Interim databases. The JES version had a resolution of 1/20 deg. with 40 levels. The simulation suggested that the decadal variability is likely caused by the variability of the Siberian High, whereas interannual variability is determined by the geographical features of the Japan Basin. Decadal-scale variation of total Russian salmon catches (Kotenev *et al.*, 2010) was introduced.

Hiroyuki Tsujino: Regional ocean-climate modeling effort in JMA-MRI

Dr. Tsujino reported on nested regional ocean-climate models in use at JMA-MRI

- Global–Western North Pacific (WNP) model,
- Global–WNP - near Japan (JPN) model,
- Global atmosphere–Global Ocean–WNP model,
- Global–Western North Pacific (WNP) model.

Purpose: long-term variability, carbon cycle and bio-geochemical processes of the western North Pacific Ocean

Global model: global tri-pole model developed for CMIP5

Western North Pacific regional model: embedded within the global model, two-way transfer

Global-WNP-near Japan model

Focus: sub-mesoscale processes around the oceanic front

$1/33^\circ \times 1/50^\circ$ (2 ~ 3 km horizontal resolution), integration with and without tide

Global atmosphere –Global Ocean–WNP model

Oceanic Global–WNP model is coupled with a global AGCM as a possible next generation climate model of JMA-MRI

WNP model improvement: Change southern boundary of the Subtropical gyre (12°N) – put the southern BC at 10°N

Hiroshi Kuroda: Regional ocean modeling around Japan based on an operational ocean forecast system of the Fisheries Research Agency (FRA-ROMS)

FRA has developed a climate modeling and downscaling subsystem around Japan (FRA-ROMS). It is used as an operational ocean forecast system with a 2 month horizon, updated weekly. The ROMS-3D VAR system is a basin-scale model with $1/2^\circ$ horizontal resolution and nesting at one tenth of a degree. Higher resolution ($1/50$ deg. Horizontal) is used for a Tosa Bay, Hokkaido coastal model, while a one tenth degree horizontal resolution model coupled to a sea-ice model is used in the Okhotsk Sea.

Shin-ichi Ito: NEMUROMS and eNEMUROMS

The North Pacific model comes in two forms:

- 1) NEMUROMS: ROMS ($dx = dy = 1/2^\circ$, 48 levels) + NEMURO
- 2) eNEMUROMS: ROMS ($dx = dy = 1/2^\circ$, 48 levels) + eNEMURO (extended North Pacific Ecosystem Model for Understanding Regional Oceanography)

The specifications of the western North Pacific model are:

- 1) NEMUROMS: ROMS ($dx = dy = 1/10$ deg., 48 levels) + NEMURO
- 2) eNEMUROMS: ROMS ($dx = dy = 1/10$ deg., 48 levels) + eNEMURO

Model parameters were optimized by PEST (adjoint method software) with a box mode and observational data. Estimating the model parameters from observational data improved the simulation results. Iron is not included. A high-resolution ($1/160^\circ \times 1/240^\circ \times 25$ levels) version of the model was used to investigate a recent problem of megadeaths of scallops in the Mutsu Bay.

Olga Trusenkova: Regional patterns of interannual sea level variability: Case of the Japan/East Sea

Dr. Trusenkova described how variation in sea level trends around the basin are forced substantially by the throughflow. Eddy Kinetic Energy (EKE) indicates that mesoscale variability is caused by instability of mean currents and their interactions with bathymetry. EKE is highest from October to November and lowest in March to April, which is the same as the seasonal variation of the circulation strength. Shear instability is important. There were no interannual counterparts of the EKE Instability Mode or SLA Gradient Mode stability of the meridional density gradient despite the large variability of the transport in the Korea Strait. The main remaining questions to be answered are: Will regional climate models reproduce this variability? What should be the change of transport in the Korea Strait for destabilizing meridional density gradient and substantially changing circulation patterns and mesoscale energetics? What are mechanisms behind the relationship with PDO? Will the east–west seesaw be maintained on the 5 year or longer time scales?

Chan Joo Jang: *A regional ocean–atmosphere coupled climate model has been developing for hindcast and future projection in the seas around Korea*

Dr. Jang reported that mixed layer changes from the fifteen CMIP5 models were analyzed and the preliminary results were given. Projected changes in the mixed layer depth (MLD) in the North Pacific Ocean have similar patterns with those of CMIP3, with considerable model-to-model difference in terms of magnitude of change. An overall decrease in MLD in the Kuroshio Extension region and an increase in the Oyashio region. The relationship between the PDO and ENSO is projected to intensify in the future, possibly due to enhanced atmospheric teleconnection between equator and the mid-latitudes.

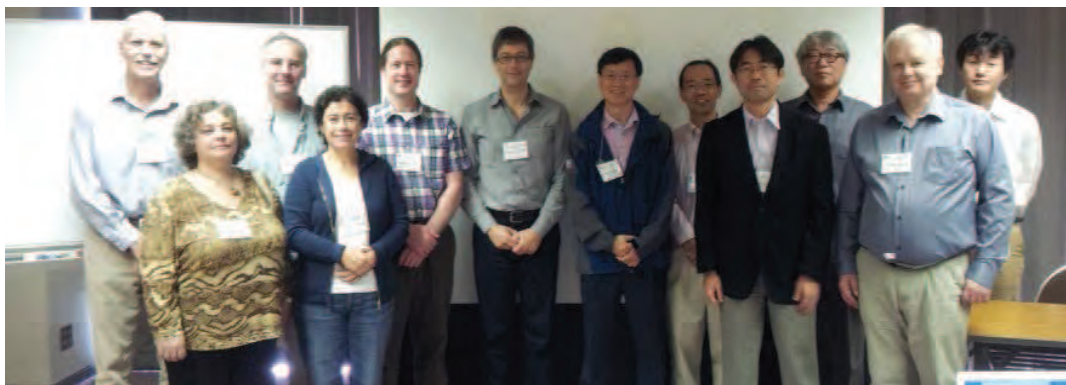
AGENDA ITEM 4

Discussion of emerging issues and schedule of upcoming activities

After the presentations, the Working Group discussed some emerging issues related with RCM development and its application to climate change studies. These included:

1. Placement and implementation of boundary conditions.
2. Downscaling of biogeochem: Worry about nutrients and less about plankton.
3. Force regional models with ensemble mean, or individual members?
4. Sea level variability issues in regional models.
5. How to estimate uncertainty in regional models.
6. How to choose which model to use for boundary conditions.
7. One- vs two-way boundary conditions.
8. Different ways to force model.
9. Overlay future anomalies on hindcast products vs. “pure” products.
10. Use (cyclo-stationary) EOF analysis to extract climate modes from global model and use that to force models.
11. Mean vs. variability: accounting for changes in variability in projections.
12. Which climate mechanisms to look for in regional models.
13. What variables (from CMIP5 models) should we provide to the rest of PICES community: T,S, MLD?
14. Where/who will analyze CMIP5 data?
15. What additional information do we need for each member’s RCM activity?

WG 29 reviewed the TORs and assigned leadership roles to each (*WG 29 Endnote 4*) before developing a plan of action for the upcoming year (*WG 29 Endnote 5*). The Co-Chairs adjourned the meeting and thanked all participants for their presentations, discussion, and commitment to conducting research directed at specific TORs.



Participants of the first meeting of WG 29 at PICES-2012. Left to right: Michael Foreman, Olga Trusenкова, Jim Christian, Angelica Peña, Seth Danielson, Enrique Curchitser, Chan Joo Jang, Shin-ichi Ito, Hiroyuki Tsujino, Kyung-Il Chang, Andrei Krovnin, and Hiroshi Kuroda

WG 29 Endnote 1

WG 29 participation list

Members

Kyung-Il Chang (Korea)
James Christian (Canada)
Enrique Curchitser (USA, Co-Chairman)
Michael Foreman (Canada)
Shin-Ichi Ito (Japan)
Chan Joo Jang (Korea, Co-Chairman)
Andrey S. Krovnin (Russia)
Hiroshi Kuroda (Japan)
Angelica Peña (Canada)
Olga Trusenkova (Russia)
Hiroyuki Tsujino (Japan)

Observers

Rongshuo Cai (China)
Seth Danielson (USA)
Skip McKinnell (PICES)
Sun Peng (China)
Elena Ustinova (Russia)

WG 29 Endnote 2

WG 29 meeting agenda

1. Welcome and self-introductions
2. Introduction to WG 29 (Curchitser) and national RCM overview (Jang)
3. Brief presentations for research topics relevant to TORs from each member
4. Discussion for some emerging issues, specific plans and schedule

WG 29 Endnote 3

WG 29 Terms of Reference

1. Assemble a comprehensive review of existing regional climate modeling efforts;
2. Assess the requirements for regional ecosystem modeling studies (*e.g.*, how to downscale the biogeochemistry);
3. Continue the development of RCM implementations in the North Pacific and its marginal seas;
4. Convene special sessions and inter-sessional workshops dedicated to the RCM topic;
5. Publish report and/or review paper on best practices for regional coupled modeling;
6. Establish connections between PICES and climate organizations (*e.g.*, CLIVAR) and global climate modeling centers (*e.g.*, NCAR, JAMSTEC, CCCMA);
7. Collaborate with other PICES expert groups such as WG-27, SICCM and the FUTURE Advisory Panels possibly by producing “Outlooks”.
8. Publish a final report summarizing results.

WG 29 Endnote 4

Terms of reference: Members’ involvement

1. Collect and summarize the current status of each member country’s regional climate modeling efforts. (Contributing members: Jang, Curchitser)
2. Exchange information of each member country’s RCM development and related research activities, and discuss some emerging issues related with RCM development and its climate application (Contributing members: all members)
3. Discuss what variables from CMIP5 models need to be available to other PICES experts group (Contributing members: Curchitser, Jang, Foreman, and other members)
4. Collect and analyze CMIP5 data focusing on North Pacific Ocean. (Contributing members: Christian, Jang)
5. Convene workshops for exchange and summarizing RCM activity. (Contributing members: Chang, Curchitser, Jang, Peña)

WG 29 Endnote 5**Action items for 2012–2013**

TOR 1, 2 and 3: Dr. Curchitser will review three requirements for RCM studies including biogeochemistry downscaling. Dr. Jang will collect and summarize information of RCM development from each member country.

TOR 4: Drs. Curchitser and Jang will contribute to a Topic Session at PICES-2013 on “*Recent trends and future projections of North Pacific climate and ecosystem*” (see below). Dr. Chang will organize the 2nd RCM workshop in September 2013, and the Co-Chairmen will also serve as Co-convenors for the workshop.

TOR 5: Both Co-Chairmen, together with other members, will publish a review paper for RCM efforts, through activities related with TOR 1–3.

TOR 6 and 7: Many members including Drs. Curchitser, Christian, and Peña will contribute to establish connections between PICES and climate organizations, and collaborate with other PICES expert groups by providing some basic data, *e.g.* mixed layer depth) for ecosystem studies.

**Proposal a 1-day Topic Session on
“Recent trends and future projections of North Pacific climate and ecosystem” at PICES-2013**

The North Pacific Ocean experiences change on a range of timescales, and is among the most difficult regions of the world ocean in which to detect secular climate trends associated with anthropogenic forcing against the background of natural variability. Understanding impacts on ecosystems and the human communities dependent on them requires understanding of the magnitudes of climate variability and change. Sustained observations of past and present states, modeling of future states with global climate models (GCMs), and downscaling of GCM projections to the regional scale are all key components of the scientific effort to understand impacts and inform adaptation efforts. Downscaling efforts are likely to include a variety of methods, both statistical and dynamical, including high-resolution regional ocean circulation models with embedded ecosystem/biogeochemical models, statistical models relating local population statistics to climate forcing or climate indices, and multi-species models forced by temperature or oxygen anomalies from regional or global models. This session invites papers on time-series of observations of the North Pacific Ocean in the context of recent climate variability and change, and future projections of changes including statistical and dynamical downscaling.

Sponsoring Committees/Program: BIO/POC/TCODE/MONITOR/FUTURE

Convenors: James Christian (Canada), Enrique Curchitser (USA), Chan Joo Jang (Korea) and Angelica Pena (Canada), Jack Barth (USA)

The Study Group on *Marine Pollutants*

The Study Group on *Marine Pollutants* (SG-MP Endnote 1) met at PICES-2012 on October 12, 2012, in Hiroshima, Japan, to finalize its report to the MEQ Committee and to formulate recommendations for future PICES activities. A draft of the Study Group report comprised input on research needs and priorities for the North Pacific Ocean, and identified opportunities for future collaboration. The SG-MP brought together participation and feedback from all six PICES member countries, and built on the successful workshop held at PICES-2011 in Khabarovsk, Russia.

The SG-MP:

- i) identified pollution priorities for the North Pacific Ocean,
- ii) proposed a selection of indicator (sentinel) approaches to pollution research and monitoring,
- iii) recommended efforts to carry out inter-laboratory calibration and method sharing, and
- iv) identified several existing or proposed multi-lateral or professional partnerships.

While the SG-MP noted variation in the responses (priorities) of PICES member countries, there was broad agreement on a common working list of important marine pollution topics for the North Pacific Ocean. These included:

- i) identification of priority pollutants (persistent, bioaccumulative and toxic pollutants; hydrocarbons; metals, elements and radionuclides; microplastics; biological pollutants);
- ii) evaluation of useful and relevant indicator approaches to assessing ocean pollution (water/air/sediments; marine mammals and seabirds; fish; benthos; seaweeds; plastics);
- iii) identification of inter-laboratory method calibration opportunities and study design sharing; and
- iv) multilateral collaboration opportunities (ICES, GESAMP, NOWPAP, SETAC).

Indicators of pollution can provide an effective integrated message to managers (e.g., response to regulations, source control, remediation, risk-based evaluation of seafood safety, general ecosystem indicators).

Based on input of the six PICES member countries during the 2011–2012 year, and deliberations during the 2012 meeting at Hiroshima, the SG-MP proposed three activities to PICES (MEQ Committee):

- i) establish a new Section on *Emerging Topics in Marine Pollution* (S-ETMP) (SG-MP Endnote 2);
- ii) convene a ½-day Topic Session at PICES-2013 (Nanaimo, Canada) on “*Status, trends and effects of pollutants in coastal ecosystems: Implications for wildlife and humans*” (SG-MP Endnote 3);
- iii) organize a workshop/field trip on “*Traditional seafoods of the Snuneymuxw First Nation: Insight into food, social and ceremonial uses*” (SG-MP Endnote 4) to be hosted at the local aboriginal community during PICES-2013.

SG-MP Endnote 1

SG-MP participation list

Members

Sang Hee Hong (Korea)
 Shigeru Itakura (Japan)
 Olga Lukyanova (Russia)
 Peter S. Ross (Canada, Chairman)
 Won Joon Shim (Korea)
 Mikhail Simokon (Russia)
 Staci Simonich (USA)
 Zijun Xu (China)

Observers

Karin Baba (Japan)
 John Elliott (Canada)
 Yochiro Ishibashi (Japan)
 Sangjin Lee (NOWPAP)
 Hideaki Maki (Japan)
 Vasiliy Tsygankov (Russia)

SG-MP Endnote 2

Proposal to establish a new Section on *Emerging Topics in Marine Pollution*

The Study Group on *Marine Pollutants* proposes a new PICES Section on *Emerging Topics in Marine Pollution* that will provide an expert platform for the timely discussion of new pollution issues and priorities in the North Pacific Ocean. Marine pollution priorities vary over space and time, and as a function of human and industrial activities. In some cases, marine pollution can affect the socio-economic well-being of coastal communities by reducing the availability of safe and abundant seafoods, affecting the health of endangered species, and/or negatively impacting the value of the ecotourism sector. The protection of ecosystem health and services requires rapid and sensitive means to detect emerging pollutant issues before serious adverse impacts arise. Regulations and/or other management actions resulting from marine pollution research in the past has led to dramatic declines in environmental concentrations of a number of harmful pollutants, subsequently improving the health of marine biota. This Section will work with the MEQ and FIS committees and provide a leadership role in the provision of advice, and the planning of special sessions and workshops. The Section will identify new contaminants of concern, clarify priority pollutant concerns, and assess the relative importance of pollutants among other natural and anthropogenic stressors.

The establishment of this Section will ensure the continued availability of expertise on marine pollutants within PICES, and deliver guidance to the FUTURE Advisory Panels (AICE, COVE and SOFE). Since climate change is affecting the transport, fate and effects of marine pollutants, this Section will also be of value to other committees, working groups and sections. Importantly, the proposed Section will address the question identified in the FUTURE Science Plan “*How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems?*”

Terms of Reference

1. Identify emerging marine pollutants in the North Pacific Ocean by:
 - a. convening timely Topic Sessions and workshops on new and emerging pollutants and pollution issues;
 - b. identifying useful indicators of status, trends and effects; and
 - c. providing ecosystem-based advice to PICES Sections, Working Groups and Advisory Panels, especially those identified in the FUTURE Science Plan (AICE, COVE and SOFE).
2. Establish partnerships with other professional or multilateral organizations (e.g., ICES, GESAMP, NOWPAP and SETAC).
3. Conduct joint activities (working group, sessions, publications) with other parties.
4. Design and/or conduct special projects on emerging marine pollutants.

Proposed Co-Chairmen: Olga Lukyanova (Russia), Peter S. Ross (Canada), Joel Baker (USA)

Proposed membership:

John Elliot (Canada)

Zhengguo Cui (China)

Zijun Xu (China)

Ziwei Yao (China)

Shigeru Itakura (Japan)

Hideaki Maki (Japan)

Sang Hee Hon (Korea)

Hyo-Bang Moon (Korea)

Won Joon Shim (Korea)

Michail Simokon (Russia)

Staci Simonich (USA)

Gina Ylitalo (USA)

SG-MP Endnote 3**Proposal for a ½-day Topic Session on “*Status, trends and effects of pollutants in coastal ecosystems: Implications for wildlife and humans*” at PICES-2013**

Marine pollutants can impact the quality and/or abundance of invertebrates, fish, and wildlife. In addition, the contamination of seafood can diminish the viability of commercial species and/or deliver potentially harmful contaminants to human consumers. While pollutant topics vary geographically, a number of priority pollutants are common throughout the northern hemisphere. This session will highlight a number of practical approaches to assessing the status, trends and effects of emerging and/or priority pollutants in the PICES region, as well as examples from other parts of the world. Some of these approaches are presently being used as indicators of marine environmental quality in some jurisdictions. Examples include the ‘Mussel Watch’ program for monitoring metals and persistent organic pollutants (POPs), spatial and temporal trends in POPs in seabird eggs, and effects of POPs and hydrocarbons on the health of marine biota. Some of these efforts have proven very useful in revealing improvements to marine ecosystem health subsequent to the implementation of regulations, including the dramatic declines in PCB, DDT, dioxin and organotin levels and associated effects. Nevertheless, a number of pollutant concerns are emerging, such as replacement flame retardants, pharmaceuticals, and current use pesticides. Characterizing the status, trends and effects of marine pollutants in coastal ecosystem components can provide cost-effective means to guide regulations, source control and/or remediation strategies that will ultimately protect ecosystem health and services.

Sponsoring Committee/Program: MEQ, FUTURE

Co-convenors: Olga Lukyanova (Russia) and Won Joon Shim (Korea)

Invited speakers: TBD

SG-MP Endnote 4**Proposal for a 1-day Workshop and field trip on “*Traditional seafoods of coastal aboriginal communities in the North Pacific: Insight into food, social and ceremonial uses at Snuneymux’w First Nation in Nanaimo, British Columbia*” at PICES-2013**

Seafoods are an integral part of the nutritional, social and cultural fabric of many aboriginal communities inhabiting coastal regions of the North Pacific Ocean. The Snuneymux’w First Nation in Nanaimo, British Columbia, is home to 1,200 residents who have relied heavily on seafoods for thousands of years. Despite now living in an urban environment with ready access to supermarket foods, it has been recently estimated that the average individual from this aboriginal community consumes 12 to 15 times as much seafood as the average Canadian. Much of this is harvested locally by native fishers. Community members routinely express concerns about the quality and quantity of their local seafoods. It is becoming increasingly evident that the availability of nutritious and uncontaminated seafoods is important for food, social and ceremonial purposes in this other coastal communities in BC. This workshop will bring together local members of the Snuneymux’w First Nation and PICES participants, and provide an invaluable opportunity for sharing, learning and teaching about the importance of traditional seafoods to this aboriginal community. The workshop will involve discussions on science and traditional ecological knowledge.

This workshop is open to any participant attending the 2013 PICES Annual Meeting, but a maximum capacity is set at 45 persons. The workshop will be of interest to persons working on issues of marine stewardship, marine resource management, seafoods, and local cultures. Local practices, culture and traditions of First Nations will be showcased at this workshop, with additional input from resource persons from other communities. The workshop will feature:

- cultural welcome and prayer from representative of the Chief-in-Council, Snuneymux’w First Nation;
- song and drum opening from local community members;
- teachings from local community elders on marine resource management and sustainable harvesting;

SG-MP-2012

- discussions on the role of traditional ecological knowledge (TEK) in a science-driven world (a panel of elders and scientists will be invited to prepare 4 × 15 minute talks, followed by discussions);
- a tour of the local seashore south of Nanaimo where practical demonstrations will take place on techniques to harvest seaweeds, shellfish and other seafoods;
- preparation of lunch foods using traditional aboriginal cooking techniques including a pit-cook and bentwood box; lunch and snacks comprising locally and seasonally-available foods as prawns, oysters, sea urchins, salmon, halibut, and a variety of crops and plants.

Sponsoring Committee: MEQ

Facilitator: Peter Ross (Canada) and local aboriginal community members

The Advisory Panel on *Continuous Plankton Recorder in the North Pacific*

The Advisory Panel on *Continuous Plankton Recorder in the North Pacific* (AP-CPR) met from 18:00–19:30 h on October 13, 2012, in Hiroshima, Japan. The meeting was chaired by Dr. Phillip R. Mundy and attended by the Chair of MONITOR, Dr. Hiroya Sugisaki. The list of participants and agenda are found in *AP-CPR Endnotes 1 and 2*.

AGENDA ITEM 3

Overview of CPR activities in 2011–2012

Dr. Sonia Batten reported that the vessel of opportunity, *Morning Cedar*, which successfully completed two east to west (E–W) transects along the Vancouver to Japan (VJ) route earlier in the year, was transferred to the east coast of North America in September 2012. A new ship, the *Madame Butterfly* was recruited and outfitted with CPR before it departed for Japan on October 4, 2012. Data from the north to south (N–S) transect in August 2012 was lost along with the CPR due to a severed towing cable. A flaw was discovered in the replacement CPR but it was repaired and the mid-September transect was successful. Difficulties notwithstanding, normal sampling effort was maintained in 2012, except for the gap in August for the 2/3 N–S transect. The 2012 sampling includes three E–W transects, April, June, October and six N–S transects, April through October.

Dr. Batten also introduced the Advisory Panel to the concept and possibilities of a new sampling device that can be deployed in tandem to the CPR, the Water and Microplankton Sampler (WaMS). The device is aimed at sampling the smaller size-fraction (nano and pico) plankton community. Collections are held in plastic bags and may or may not be preserved. Samples are then amenable to analysis by a number of techniques including flow cytometry, molecular probes and barcoding, and Harmful Algal Bloom microarrays.

Status of funding commitments

Dr. Batten presented the chart below to illustrate the availability and timing of funding from Canada (Fisheries and Oceans Canada, DFO), Japan, the United States (North Pacific Research Board, NPRB, and Exxon Valdez Oil Spill Trustee Council, EVOS) and the Sir Alister Hardy Foundation for Ocean Science (SAHFOS). Details on funding outlooks are presented in national section reports.

Source	2011	2012	2013	2014	2015	2016
NPRB	█	█	█	█		
DFO	█	█	█	█		
Japan	█	█	█	█	█	█
EVOS	█	█	█	█	█	█
SAHFOS						

AP-CPR-2012

AGENDA ITEM 4

Report from the Second Workshop of Global Alliance of Continuous Plankton Recorder Surveys (GACS)

Advisory Panel members, Dr. Sanae Chiba and Dr. Batten, attended the second meeting of GACS at the UNESCO Intergovernmental Oceanographic Commission, Paris, on September 19–20, 2012. The report of the meeting was presented by Dr. Batten. The meeting at UNESCO allowed GACS to be initiated as a formal organization with a governing body, on which Dr. Batten and Dr. Chiba sit. GACS aims to provide a powerful set of tools for understanding biological consequences of climate change. GACS can do so because it has access to information products on status of plankton collected and processed using standard methods from much of the world's oceans. Information products include maps comparing four standard measures, Phytoplankton Colour Index (PCI), Total Diatoms, Total Dinoflagellates, and Mean Copepod Community Size. (See web link in *AP-CPR Endnote 3*.) The information will be published annually as the Global Ecosystem Status Report, GESR. GESR 2010–2011 is now in draft.

AGENDA ITEM 5

Reports and comments of national representatives

Canada

Dr. Batten reported on behalf of Dr. David Mackas who was unable to attend. Canadian funding is expected to continue at the same level through March 2014, when it will be evaluated for renewal.

Japan

Dr. Chiba presented a report, *Japanese Contribution to the North Pacific CPR Projects, FY2011-2012 Activities*. The samples from 2010 have been processed, the 2011 sample processing is underway, and stable isotope analysis has been completed on selected samples. The project is currently making a Japanese language version of the CPR promotional and educational video originally produced in English by the Sir Alister Hardy Foundation for Ocean Science (SAHFOS). Dr. Chiba presented highlights from the recently published paper in *Geophysical Research Letters* (Chiba *et al.* 2012, full citation below). The paper presented finding of a good correlation between bloom timing and the PDO-derived SST anomaly. Further, in years of warm spring, the bloom occurred earlier than in years with cool springs. The phytoplankton community changed in response to the extent of seasonal warming and mixed layer shoaling, rather than responding to SST values at a time. Findings on interannual variation of the phytoplankton community were that diatom abundance was high in the years of rapid SST increase during March through April, and dinoflagellates dominated in the years of rapid SST increase in May through June. The pattern is similar to the PDO, although the correlation was not significant.

Current funding is provided by grants that conclude at the end of 2013. Two additional grants have been proposed for funding since FY2012 to secure the current level of contributions up to FY2017. The bulk of the anticipated funding is to be devoted to the personnel who do the analyses, rather than to collecting new observations.

USA

The North Pacific Research Board funding is secure through mid-2014, and a Request for Proposals specific to monitoring, including CPR, has been scheduled for June 2013, although it is not yet released. The timing of the monitoring RFP makes possible continuation of support in 2014 without interruption.

The Exxon Valdez Oil Spill Trustee Council (Anchorage, USA) has implemented its long-term commitment to support through 2016 with the possibility of renewal for an additional five years, dependent on performance, as part of the larger Gulf Watch Alaska project.

Recent budgetary conditions are not conducive to developing direct support from NOAA's National Marine Fisheries Service. Although NMFS' Alaska Fisheries Science Center's Auke Bay Laboratories continues to

support North Pacific CPR through networking with funding sources in Alaska, the ability to establish a CPR sorting facility in Juneau, as had been hoped, is unlikely in the present budget cycle.

Recommendation: MONITOR recommends Science Board to request the PICES Secretariat to send a cover letter with information on CPR to key U.S. supporters and allied agencies to heighten awareness of CPR and PICES' continued involvement and support in March, 2013. (Draft language and names and addresses of contacts to be provided to the Secretariat through the MONITOR Chair.)

AGENDA ITEM 6

Publications

- Chiba S, S. Batten, K. Sasaoka, H. Sugisaki (2012). Influence of the Pacific Decadal Oscillation on phytoplankton phenology and community structure in the western North Pacific based on satellite observation and the Continuous Plankton Recorder survey for 2001–2009. *Geophysical Research Letters*. Vol. 39, L15603, doi:10.1029/2012GL052912.
- Chiba S, T. Yoshiki, K. Sasaoka, H. Sugisaki, T. Ono, S. Batten (2012). Lower trophic level linkage and cool-warm cycle based on the North Pacific CPR survey 2001–2009: An implication for the future warming ocean. Second International Symposium on “*Effects of climate change on the world's oceans*”, May 13–20, 2012, Yeosu, Korea.
- Rooper, C.N., J.L. Boldt, S.D. Batten, C. Gburski. (2012). Growth and production of Pacific ocean perch (*Sebastes alutus*) in nursery habitats of the Gulf of Alaska. *Fishery Oceanography* 21, 415–429.
- Yoshiki, T. *et al.* Developmental timing of mesozooplankton in the western North Pacific Ocean during 2001-2009 based on the Continuous Plankton Recorder. (JPR? MS in preparation)

Other contributions

- DFO “State of the Ocean” Report. State of physical, biological, and selected fishery resources of Pacific Canadian marine ecosystems in 2011, edited by W.R. Crawford and J.R. Irvine. <http://www.pac.dfo-mpo.gc.ca/science/oceans/reports-rapports/state-ocean-etat/index-eng.htm> DFO Can. Sci. Advis. Sec. Res. Doc. 2012.
- NOAA's Ecosystem Considerations report (in August 2012): Batten, S.D. Continuous Plankton Recorder data from the Northeast Pacific. <http://access.afsc.noaa.gov/reem/ecoweb/Index.cfm>.

Presentations at PICES-2012

- Sanae Chiba (Invited Speaker) on “*Contrast of the lower trophic level responses to climate forcing over the eastern and western North Pacific*” at the MEQ Workshop (W6) on “*The contrasting cases of HABs in the eastern and western Pacific in 2007 and 2001*”.
- Sonia Batten (co-authored by Anthony Walne) on “Ship of opportunity sampling of lower trophic levels” at the FIS/MONITOR/POC Topic Session (S4) on “Monitoring on a small budget: Cooperative research and the use of commercial and recreational vessels as sampling platforms for biological and oceanographic monitoring”.

Further details can be found in the Session Summaries section of the [2012 Annual Report](#).

AGENDA ITEM 7

New business

None presented.

AP-CPR-2012

AP-CPR Endnote 1

AP-CPR participation list

Members

Sonia D. Batten (Canada, SAHFOS)
Sanae Chiba (Japan)
Hyung-Ku Kang (Korea)
Phillip R. Mundy (USA, Chairman)

Observers

Tsuneo Ono (Japan)
Hiroya Sugisaki (Japan, MONITOR Chairman)

AP-CPR Endnote 2

AP-CPR meeting agenda

1. Welcome (Mundy)
2. Additions and modifications to agenda
3. Overview of CPR activities in 2011 – 2012 (Batten)
4. Report from Second (Sept 2012) Workshop of Global Alliance of Continuous Plankton Recorder (CPR) Surveys (Chiba and Batten)
5. Reports and comments of national representatives
6. Receive suggestions for 2011 – 2012 AP-CPR Annual Report (Mundy)
7. New business
8. Adjourn

AP-CPR Endnote 2

Web links relevant to AP-CPR AP meeting

SAHFOS

<http://www.sahfos.ac.uk/sister-survey/pacific-cpr-survey/background.aspx>

PICES AP-CPR

http://www.pices.int/members/advisory_panels/CPR.aspx

PICES CPR

<http://www.pices.int/projects/tcprstnp/default.aspx/#data>

Data: North Pacific Survey and CTD

www.pices.int/projects/tcprstnp/default.aspx

Global Alliance of CPR Surveys

<http://www.globalcpr.org/>

North Pacific CPR Survey

<http://www.globalcpr.org/about-gacs/north-pacific-cpr-survey.aspx>

The Advisory Panel for a *CREAMS/PICES Program* in *East Asian Marginal Seas*

The meeting of the Advisory Panel for *Circulation Research in East Asian Marginal Seas/PICES Program* (AP-CREAMS) was held during PICES-2012 in Hiroshima, Japan. Five Advisory Panel members, and three observers, from Japan, Korea and Russia attended the meeting (*AP-CREAMS Endnote 1*). Dr. Kyung-Ryul Kim, Co-Chairman of AP-CREAMS, opened the meeting at 14:00 h, October 14, 2012 and reviewed the agenda (*AP-CREAMS Endnote 2*). Dr. K-R. Kim stated that this was the second meeting of the year held by the Advisory Panel, following the one held in May in Yeosu, Korea (see *AP-CREAMS Endnote 3*). Co-Chairman, Dr. Vyacheslav Lobanov (Russia), was not able to attend the meeting because of a cruise, and none of the Chinese members were able to attend because of the limitation for chances of abroad travel.

AGENDA ITEM 2

National reports on activities and plans related to the CREAMS/PICES Program

China

Dr. K.-R. Kim briefly reported that he visited China and had discussions with three Chinese members and found there were many activities going on in China, especially related to the Yellow Sea and East China Sea areas. We agreed that these activities will be of great benefit for us to formulate EAST-II program. Furthermore, the next AP-CREAMS meeting will be hosted by Chinese members, possibly in conjunction with the PAMS meeting at Hangzhou.

Korea

Dr. Kyung-Il Chang presented the status of time-series measurements in the Japan/East Sea maintained by the Korean EAST-I program, National Fisheries Research and Development Institute (NFRDI), and Korea Institute of Ocean Science and Technology. New components added to the existing time-series measurements are the acquisition of full-depth current profiles in the Japan Basin using the LADCP (Lowered Acoustic Doppler Current Profiler) during the Korea-Russia joint survey in October 2012, and an initiation of ship-of-opportunity surface water monitoring of temperature, salinity, and chlorophyll in the Ulleung Basin by NFRDI from July 2012. Dr. Chang also introduced the 2013 observation plan including the long-term deployment of an array of 4 or 5 current meter moorings in the Japan Basin as a part of the Korea-Russia joint activities. The main objectives of the moored observation are to quantify the volume transports of subsurface water masses, and to identify the physical forcing affecting the temporal variation of biogeochemical properties in the Japan Basin. Two autonomous moored profilers carrying biogeochemical and optical sensors will be a part of the mooring. Korea EAST-I program will host OceanSITES 2013 (9th Steering Committee and 6th Data Management Team Meetings) in Seoul in May 2013.

Japan

Co-Chairman, Dr. Joji Ishizaka, reported on the success of the T/S *Nagasaki-maru* and R/V *Tansei-maru* cruises as activities of EAST-II. He stated that the cruises are important as international collaborative capacity building activities. Giant jellyfish were fairly abundant but not as much as during 2002–2007, and temperature may control their abundance during the spring time. A presentation related to this was given in BIO/FIS Topic Session (S7) at PICES-2012. Also, 1-mm size ephyrae of giant jellyfish were found for the first time off Changjiang Estuary in May 2011 through collaborative research between Japan, China and Korea. Dr. Toshitaka Gamo added some words about the cruises including the *Nagasaki-maru* cruise conducted in EAST-I region by Dr. Jiang Zhang of Toyama University. He also mentioned that the *Tansei-maru* is old, and the construction of a new JAMSTEC vessel has been started. Dr. Ishizaka introduced a new project “The Study of Kuroshio Ecosystem Dynamics for Sustainable Fisheries (SKED)” led by Dr. Hiroaki Saito and pointed out that this is one of the major projects in the Kuroshio area including the East China Sea for the next 10 years.

AP-CREAMS-2012

Russia

Dr. Yury Zuenko described briefly Russian monitoring programs in the EAST-I region, with special attention to the programs of the Pacific Fisheries Research Center (TINRO), including infrequent general surveys of the Russian EEZ, annual surveys of the shelf zone along the Primorye coast, and Peter the Great Bay, and frequent detailed sampling in its inner part carried out monthly from May to October since 2007. Long-term series of oceanographic and biological data for the Russian EEZ were presented and recent tendencies in the oceanographic regime and changes in the marine ecosystem were considered: on the background of a warming trend in all layers of the Sea, the last decade was peculiar due to relative cooling in the surface layer, in particular for winter; in spite of the tendency for increasing zooplankton abundance, a low-biomass state of top trophic levels (nekton) has been noted since the 1990s, with extremely low stocks of both the mass subtropical species, such as sardine, and cold-water species, such as walleye pollock and herring (with exception of its Korean population).

AGENDA ITEM 3

Capacity building activities in 2013 and later

NOWPAP Remote Sensing training course in China in 2013

Dr. Ishizaka announced that CEARAC/NOWPAP is proposing their fourth training course on “*Remote sensing data analysis*” in Qingdao, China in 2013 as a joint activity of NOWPAP, IOC-WESTPAC and PICES and suggested that AP-CREAMS should support the proposal. Members agreed that the training course is part of the capacity building activities of AP-CREAMS and that they would assist in the activity. AP-CREAMS suggests that the POC and MONITOR Committees support the joint NOWPAP/IOC-WESTPAC/PICES training course and provide financial support in the form of travel grants for one trainer and one trainee from PICES member countries to attend.

Workshop/training course on “ecological modeling” in 2014

Dr. Kim proposed a summer school for ecosystem modeling in 2014. Dr. Kim and Dr. K.I. Chang both agree to prepare the one-page proposal for PICES.

AGENDA ITEM 4

Status report on international cooperation

R/V Akademik Oparin cruise in 2012

Dr. Kim reported that the Russia-Korea collaborative cruise of the R/V *Akademik Oparin* was successfully started. The ship left from Vladivostok, Russia, on October 9, 2012, and left Donghae, Korea, on October 13 with 15 Russians and 16 Koreans on board, including Dr. Lobanov, and conducted sampling at the first station on October 13 in the EAST-I region. The cruise will last 22 days. A similar cruise is being planned in 2013 and hopefully, there will be participation from other countries.

Other possible cruises in 2013 and later

Dr. Gamo will apply the *Tansei-maru* cruise in 2013 or 2014 for an international cruise. Dr. Ishizaka or his colleagues also will apply the *Nagasaki-maru* cruise in 2013.

AGENDA ITEM 5

Preparation and submission of final version on Supplementary Chapter of PICES North Pacific Ecosystem Status Report-2010 Status and trends of East Asian Marginal Seas in 2003–2010

Dr. Kim reported that the revised version of the supplementary chapter of PICES North Pacific Ecosystem Status Report (NPESR) was submitted to Science Board and the PICES Secretariat on October 10, 2012. A

previous version had been sent on October 2011 to Dr. Hiroya Sugisaki, Chairman of MONITOR, and Mr. Robin Brown, Chairman of AP-SOFE, who sent comments their on April 18 and on July 18, 2012, respectively, which were forwarded to AP-CREAMS and *ad hoc* committee members. An *ad hoc* committee meeting was held in Seoul from September 17–18, 2012, and final version was distributed to AP-CREAMS members for viewing. Dr. Kim also mentioned that the task of the *ad hoc* committee and AP-CREAMS members had ended, and expressed thanks to the *ad hoc* committee members and authors for their hard work and hope for the quick publication of the report. Dr. Yukimasa Ishida noted that Japan/East Sea is used in the present draft. He pointed out that Japan Sea is the internationally recognized and established name and used in other international organizations, and that the PICES is also an international organization and has a responsibility of being a model to other organizations. He further mentioned that the Japanese government cannot just overlook that PICES becomes a source of confusion and cannot accept the wording of Japan/East Sea in the present draft, which is not recognized internationally.

AGENDA ITEM 6 **EAST-II Program**

Dr. Kim reported that writing of an extensive status report or review of the EAST-II region is under discussion and that the idea was of interest to many AP-CREAMS members, including Chinese members. Dr. Ishizaka and Dr. Jae-Hak Lee suggested Joji Ishizaka (Biology), Jing Zhang (Chemistry), Takeshi Matsuno (Physics), Jae-Hak Lee (Physics) and Suam Kim (Biology) as *ad hoc* committee members, and that Chinese members are not decided. Dr. Ishizaka suggested the nomination of three AP-CREAMS members, Sumei Liu (Chemistry), Dongfeng Xu (Physics) and Fei Yu (Physics) as tentative *ad hoc* committee members to which the meeting AP-CREAMS members agreed. In addition, Dr. Lobonov was also nominated as a Russian *ad hoc* member. AP-CREAMS members discussed the possible form of the report, including extended status report similar to the supplementary chapter of NPESR or scientific review papers, and geographical limitation of the area. Dr. Kim suggested that the *ad hoc* committee members further discuss these issues and decide the direction. He pointed out that the 17th Pacific-Asian Marginal Seas (PAMS) meeting in Hangzhou, China, April 23–25, 2013, may be a good chance for discussion, and suggested the Japanese and Korean *ad hoc* members visit China to discuss the report with the Chinese *ad hoc* members. Dr. Ishizaka added that PEACE symposium in Nagoya University on November 28–29, 2012, would also be a good opportunity to start discussion of the report, and suggested AP-CREAMS members to attend.

AGENDA ITEM 7 **Next AP-CREAMS meeting**

It was decided to hold the next AP-CREAMS meeting in Hangzhou, China, hosted by Dr. Dongfeng Xu or in Qingdao, China, hosted by Dr. Sumei Liu, with relation to PAMS meeting.

AGENDA ITEM 8 **Miscellaneous items**

Dr. Gamo expressed his wish to be replaced by Dr. Jing Zhang of Toyama University. AP-CREAMS members suggested that Dr. Zhang be added as another Japanese member, and Dr. Gamo agree not to step down. Dr. Ishizaka will ask the Japanese national delegate to add Dr. Zhang as a member of AP-CREAMS.

AGENDA ITEM 9 **Closing**

Dr. K.-R. Kim closed the meeting at 16:00 h, October 14, 2012.

AP-CREAMS Endnote 1

AP-CREAMS participation list

Members

Kyung-Il Chang (Korea)
Toshikazu Gamo (Japan)
Naoki Iguchi (Japan)
Joji Ishizaka (Japan, Co-Chairman)
Kyung-Ryul Kim (Korea, Co-Chairman)
Yury Zuenko (Russia)

Observers

Yukimasa Ishida (Japan)
Ungyul Li (Korea)
Hiroya Sugisaki (Japan)



Participants at the AP-CREAMS meeting at PICES-2012 in Hiroshima, Japan, (left to right) Yukimasa Ishida, Yury Zuenko, Naoki Iguchi, Toshikazu Gamo, Kyung-Ryul Kim, Joji Ishizaka and Kyung-Il Chang

AP-CREAMS Endnote 2

AP-CREAMS meeting agenda

1. Opening remarks
2. Brief national report on activities and plans related to CREAMS/PICES Program
3. Discussion on capacity building activities in 2013 and later
 - 3.1 NOWPAP Remote Sensing training course in China on 2013
 - 3.2 Workshop/training course on “ecological modeling” on 2014
4. Status report and discussion on international cooperation
 - 4.1R/V *Akademik oparin* cruise in 2012
 - 4.2 Possible other cruises in 2013 and later
5. Preparation and submission of final version on Supplementary chapter of PICES North Pacific Ecosystem Status Report-2010

6. Progress on EAST-II Program
7. Next AP-CREAMS meeting
8. Miscellaneous items
9. Closing

AP-CREAMS Endnote 3

Summary Report of the meeting of the Advisory Panel for a *CREAMS/PICES Program for East Asian Marginal Seas*

MVL Hotel, Yeosu, Korea
May 18, 2012

1. Opening remarks

Co-Chairman Dr. Kyung-Ryul Kim started the meeting on 12:00 h in May 18, 2012. He mentioned that this meeting was not official because there was no Chinese member. Co-Chairman Dr. Joji Ishizaka and Co-Chairman Dr. Vyacheslav Lobanov thanked Dr. K.-R. Kim and other Korean colleagues for hosting this meeting in Korea (*Annex 1 and 2*).

2. Brief national reports on recent activities and plans related to the CREAMS/PICES program

Japan

Dr. J. Ishizaka and Dr. Jiang Zhang mentioned the *Nanasaki-Mar* and *Tansei-Mar* cruises in 2012. Dr. J. Zhang mentioned the changes after the earthquake including budget and cruise allocations.

Korea

Dr. K.-R. Kim mentioned that the second stage of the EAST-I project has been started. Dr. Jae Hak Lee mentioned the change from KORDI to KIOST including education and increase of budget.

Russia

Dr. V. Lobanov mentioned that under the NEAR-GOOS project POI and JMA have started a synchronous annual cross-basin climate monitoring section that continues Japanese PM line to the north along 134°E up to the Russian coast. The first section was implemented by POI and JMA vessels on 3–6 November 2011. He also mentioned that POI made 4 short cruises within Russian territorial waters to look at slope convection processes in the Peter the Great Bay during February–April 2012 and preparations for the cruise from Vladivostok to Kuril Islands as a monitoring activity after the Fukushima accident.

3. Discussion on capacity building activities in 2012 and later

Workshop/training course on “ecological modeling” on 2014

Dr. K.-R. Kim mentioned the plan of a workshop/training course on “ecological modeling” in 2013. Dr. Sinjae Yoo stated that PICES had decided that a summer school on Ocean Monitoring will take place in Oregon, USA, in 2013 and suggested the time be changed to avoid conflicts. Dr. K.-R. Kim decided to shift the workshop/training course to 2014.

Others

Dr. J. Ishizaka mentioned that NOWPAP is planning a 4th training of remote sensing in China in 2013 and asked PICES to support as a partner.

4. Status report and discussions on international co-operation

Japan

Dr. J. Ishizaka mentioned that the *Nagasaki-Maru* cruise is planned for July 18–28, 2012 around Tsushima and Goto Islands, Nagasaki, Japan, and asked the participation from other countries. Dr. J. Zhang mentioned that the *Tansei-Maru* cruise is planned for September 23–October 2, 2012, from Ryukyu Islands to the continental shelf of the Korean EEZ to understand the Kuroshio–shelf flux. Although the berth is not available, sampling may be possible. Dr. K.-R. Kim suggested Dr. J. Ishizaka and Dr. J. Zhang distribute the detailed cruise plan. Dr. J. Zhang also mentioned a plan of the *Hakuho-Maru* cruise in the East China Sea in 2015 and possible simultaneous cruises with China and Taiwan, and will ask for the possibility to join.

Russia

Dr. V. Lobanov mentioned about Korea–Russia joint cruise in mid-September to October 12, 2012, in the southern-central-northwestern EAST-I area, including a long-term monitoring section along 132°E. Fifteen Russian and 15 Koreans are planning to participate, and there is the possibility of other countries joining in the future. He also mentioned that the series of the cruises will be continued and suggested simultaneous international cruises with multiple ships may be feasible. All the participants agreed that simultaneous international cruises with multiple ship operations may be a good solution to the national boundary problem, and decided to keep further discussion.

Korea

Dr. J.-H. Lee explained the planning stage of new observational projects after 2013 focusing on climate change, environment and ecosystem in the EAST II area. He also introduced a new time series measurement site in the area southeast of Jeju-do. A surface buoy with various meteorological (wind, heat flux, *etc.*) and oceanographic (T, S, DO, Chl-*a*, *p*CO₂, water velocity, *etc.*) sensors was installed in early May 2012. The data are automatically delivered to KORDI and will be opened to researchers.

5. Discussion and decision on Supplement of PICES North Pacific Ecosystem Status Report

Current status from Science Board

Dr. S. Yoo explained the status of the report. It has been reviewed by MONITOR and AP-SOFE, and they were generally satisfied with the scientific content but suggested some revisions. SOFE suggested that it need more technical editing, and SOFE and MONITOR found inconsistencies among sections and with other chapters such as interpretation, description, *etc.* Governing Council postponed the decision of the publication because of the naming issue.

What next?

Dr. K.-R. Kim pointed out the possibility to make a summary consistent with other chapters if it is necessary. He requested AP-SOFE to finish the review as soon as possible so that the revision can be started immediately. Dr. David Checkley suggested that it is necessary to publish the status report as fast as possible and to consult IOC for coordination of the naming issue. Dr. J. Ishizaka suggested a change to the name, such as the name of the current systems in order to avoid the delay. Dr. K.-R. Kim requested Science Board and Council to find the solution within one month so that the report can be ready for publication by the next annual meeting.

6. Progress report on the EAST-II program

Further report on PEACE

Dr. J. Ishizaka proposed to have the PEACE meeting on the week of December 3–7, 2012. Dr. Dong-Jin Kang pointed out that there is an AGU meeting on that week. Dr. J. Ishizaka agreed to search the possibility of holding it on the last week of November and to distribute the schedule as soon as possible.

Status report for the Yellow Sea and East China Sea

Dr. J. Ishizaka suggested that an extended version of the status report for EAST-II similar to EAST-I is a good activity of EAST-II, as proposed by Dr. K.-R. Kim through an e-mail on December 9, 2011, and participants agreed. Dr. S. Yoo mentioned that Science Board is discussing making a web version of the status reports to make updating easier. Dr. V. Lobanov suggested using a different name for the extended version of the status report to avoid the confusion with previous PICES status reports. Dr. J. Ishizaka agreed to distribute the first ideas of the *ad hoc* committee members for the writing and of the contents.

7. Next CREAMS-AP meeting

Members agreed to have the next AP meeting on 14:00 h, October 14, 2012 as a part of next PICES Annual Meeting in Hiroshima, Japan.

8. Closing

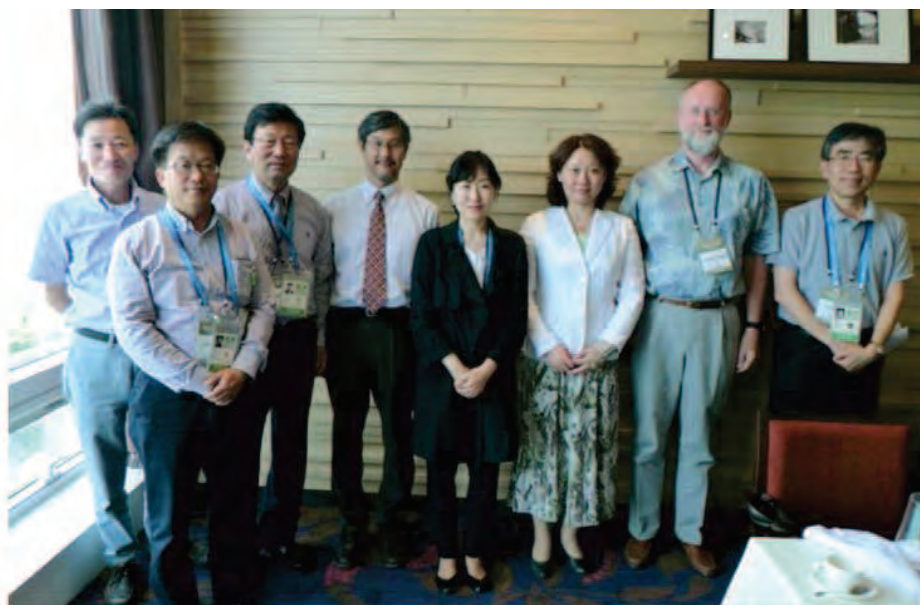
The Co-Chairman, Dr. K.-R. Kim, closed the meeting at 14:00 h, May 18, 2012. All the members expressed appreciation of the arrangement of the meeting.

Annex 1**AP-CREAMS participation list**Members

David Checkley (USA)
 Joji Ishizaka (Japan)
 Jae-Hak Lee (Korea)
 Vyacheslav Lobanov (Russia, Co-Chairman)
 Kyung-Ryul Kim (Korea, Co-Chairman)

Observers

Chan Keun Kang (Korea)
 Dong-Jin Kang (Korea)
 Taehee Na (Korea)
 Sinjae Yoo (Korea)
 Jing Zhang (Japan)



Participants at the CREAMS/PICES workshop meeting held at Yeosu, Korea, (left to right) CG Kang, Dong-Jin Kang, Kyung-Ryul Kim, Joji Ishizaka, Taehee Na, Jing Zhang, Vyacheslav Lobanov, Jae-Hak Lee.

Annex 2

AP-CREAMS meeting agenda

1. Opening remarks
2. Brief national reports on activities and plans related to the CREAMS/PICES program
3. Discussion on capacity building activities in 2012 and later
 - 3.1 Workshop/training course on “ecological modeling on 2014”
 - 3.2 Others
4. Status report and discussions on international co-operation
 - 4.1 Japan
 - 4.2 Russia
 - 4.3 Korea
5. Discussion and decision on PICES North Pacific Ecosystem Status Resport-2010
 - 5.1 Current status from SB
 - 5.2 What next?
6. Progress report on EAST-II program
 - 6.1 Further report on PEACE
 - 6.2 Status report for Yellow Sea and East China Sea
7. Next AP-CREAMS meeting
8. Closing

The Advisory Panel on *Marine Birds and Mammals*

The meeting of the Advisory Panel for *Marine Birds and Mammals* (AP-MBM; under the auspices of BIO Committee) was held from 09:30–17:00 hours on 13 October 2012 in Hiroshima, Japan. The business meeting focused on the activities of AP-MBM at the Annual Meeting, and on preparations for a 2-day workshop to fulfill the objectives of the Activity Plan adopted during the 2011 Annual Meeting.

AGENDA ITEM 1

Welcome

Dr. Yutaka Watanuki (Japan), Co-Chair of AP-MBM, called the meeting to order and welcomed members and observers (*AP-MBM Endnote 1*). AP-MBM members representing Canada, Japan, and USA were present. AP-MBM asks that parent Committee, BIO, request all countries to send delegates to PICES Annual Meetings and AP-MBM business meetings, and that China and Korea nominate members to the AP-MBM. The attendance of two seabird experts from Canada, Drs. Ken Morgan and John Elliot, was noted and appreciated.

AGENDA ITEM 2

Adoption of agenda

The agenda was reviewed and approved (*AP-MBM Endnote 2*).

AGENDA ITEM 3

Reports from participants

Dr. Robert Suryan (USA) reported on the progress of a special publication resulting from the 2011 joint PICES/ICES Topic Session (S2: BIO/POC Topic Session entitled “*Mechanisms of physical-biological coupling forcing biological “hotspots”*”). The deadline for manuscript submission was July 1, 2012, and manuscripts that were submitted are in various states of review. Accepted manuscripts (the editors are targeting 8–12) are approximately 1 year from publication in *Marine Ecology Progress Series*.

Dr. Peter Ross (Canada) reported on the progress of the Study Group on Marine Pollutants (SG-MP), which Dr. Ross chairs. The Study Group will be proposing, through MEQ, the formation of a new PICES Section on Emerging Topics in Marine Pollutants (S-ETMP). The Study Group will also be proposing a 1-day Workshop on “*Traditional seafoods of the Snuneymux’w First Nation in Nanaimo, BC: Insight into food, social and ceremonial uses*”, and a ½-day joint PICES/ICES Topic Session “*Status, trends and effects of pollutants in coastal ecosystems: Implications for wildlife and humans*” to be held at the PICES-2013. AP-MBM supports the SG-MP draft proposals, and noted the importance of these subjects to marine birds and mammals.

Dr. Ross also introduced BIO/MEQ Topic Session S6, entitled “*Environmental contaminants in marine ecosystems: Seabirds and marine mammals as sentinels of ecosystem health*”, to be held October 17, 2012. This session will identify spatial patterns and geographic areas of concern for pollutants or other stressors using bio-indicator species; examine mechanisms of transport, and ultimate disposition, of contaminants in marine ecosystems; and discuss health risks for certain predators and human consumers. Ten papers are included in this ½-day session that was proposed by AP-MBM and is being convened by Dr. Ross, Dr. Watanuki, and Dr. Hideshige Takada (Japan). AP-MBM discussed the benefits of this session and how it links to the AP-MBM Activity Plan. There was also discussion regarding the appropriateness of including human health risks in the abstract for the session. A brief report summarizing the presentations and conclusions was prepared by the co-convenors following the session and can be found in the Session Summary section of the Annual Report.

AP-MBM-2012

Dr. Hidehiro Kato (Japan) reported (*AP-MBM Endnote 3*) on his activities as the PICES liaison to the International Whaling Commission (IWC). The panel thanked Dr. Kato for his efforts to integrate PICES science into the IWC science-policy arena, and recommends to BIO that Dr. Kato remain as the PICES liaison. The AP also recommends to BIO that PICES support making a request to the IWC to include a seabird observer on the IWC POWER cruise. This sighting survey in the North Pacific covers a large geographic area, and will help meet the objectives of the new AP-MBM Activity Plan by providing valuable at-sea distribution data for seabirds. Dr. William Sydeman (USA) and Dr. Suryan (USA) will lead efforts to organize activities and obtain support for seabird observer(s) on this cruise should a request be approved by the IWC.

Dr. George Hunt (USA) reported on the activities of PICES Workshop W3 on “*The feasibility of updating prey consumption by marine birds, marine mammals, and large predatory fish in PICES regions*”. A more complete report of W3 can be found in the Session Summary section of this Annual Report. W3 was held on October 13, 2012, and was convened by Dr. Hunt (USA), Dr. Kato (Japan), and Dr. Michael Seki (USA). Information was presented on the availability of new data (post 1998) on the distribution, abundance, and diets of marine birds, marine mammals and large predatory fish across the North Pacific. W3 participants agreed that an update of the information on prey consumption by marine birds and mammals throughout the PICES areas of the North Pacific Ocean (contained in PICES Scientific Report 14, 2000) is warranted where these new data are available.

W3 participants also agreed that it would be valuable and possible to include a select group of large predatory fishes (tuna, salmon, groundfish) in a new technical report on prey consumption by top predators. W3 participants acknowledged that considerable effort and resources would be required to assemble and integrate the requisite information. In addition, the appropriate framework, leadership, and participation necessary to undertake this task were not decided during W3. AP-MBM members discussed these issues in depth, and while they acknowledged the value of updating and producing a new report on prey consumption, they noted the ongoing commitments by members of AP-MBM in its approved Activity Plan. AP-MBM participants also noted that its ongoing activities in spatial ecology would provide complementary information needed for an update on prey consumption, and that this work could be done sequentially. In summary, the framework and participants needed for a new effort on prey consumption could not be determined at this time. One member of AP-MBM, Dr. Andrew Trites (Canada), indicated a willingness to explore ways in which a new report on prey consumption could be prepared. AP-MBM will evaluate the options for updating estimates of prey consumption in the North Pacific in 2013 with the expectation that a formal request may be made at the 2013 Annual Meeting to establish a new Working Group on Top Predator Prey Consumption.

Action: Dr. Trites (Canada) to explore ways in which a new report on prey consumption could be prepared.

AGENDA ITEM 4

Discussions

a. AP-MBM Terms of Reference

In response to the new overall PICES Science Plan of FUTURE, revised Terms of Reference (TOR) for AP-MBM were adopted at the 2011 Annual Meeting, and were subsequently approved by BIO. These Terms of Reference (*AP-MBM Endnote 4*) were reviewed and agreed upon.

b. Progress of AP-MBM Activity Plan

AP-MBM developed a 3-year Activity Plan that was adopted at PICES-2011, and was approved by the BIO Committee (*AP-MBM Endnote 5*). Discussion of the Activity Plan was conducted during the afternoon and revolved around proposals for the PICES 2013 Annual Meeting. In particular, AP-MBM focused on the specific goals and participants of the proposed Workshop, and on assessing the plans of the Workshop relative to the overall objectives and proposed products of the AP-MBM Activity Plan.

c. Review of topic session proposal for PICES 2013

Dr. Sydeman reviewed the nature of the ½-day Topic Session proposed for PICES-2013, titled “*Are marine ecosystems of the North Pacific becoming more variable?*” (*AP-MBM Endnote 6*). If approved, the session will be convened by Dr. Steven Bograd, Dr. Libby Logerwell, Dr. Sydeman, and Dr. Watanuki. Dr. Sydeman indicated that he has received positive feedback and interest from the list of possible invited speakers.

AGENDA ITEM 5

Review activities related 3-year program of AP-MBM, Spatial Ecology and Conservation, and workshop proposed for PICES-2013

Dr. Suryan led the afternoon discussion focusing on the AP-MBM Activity Plan and the importance of the proposed workshop (*AP-MBM Endnote 7*) for the successful completion of the overall objectives of the Activity Plan. The objectives of the Activity Plan are:

1. Compile and integrate available datasets from tracking and vessel-based survey studies of marine birds and mammals.
2. Synthesize distribution data of MBMs and assess changes over time.
3. Examine physical and biological factors that correspond to high use “hot spots”.
4. Map and provide information on important ecological areas in the PICES regions.

AP-MBM discussed how the end products of the Activity Plan would/could be used; whether the activities should involve habitat modeling (in addition to the compilation of datasets to create distribution maps and summaries); whether the end-product would incorporate a database (in addition to a PICES Scientific Report); where the final products and database would reside; whether our efforts would incorporate into any existing regional/global database; and what additional sources of funding would be available to support the workshop and, possibly, to support a spatial analyst for 1–2 years.

It was agreed that input data would include tracking (satellite, GPS, geolocator) data, strip and line transect vessel survey data (at this time, we do not intend to use data from platforms of opportunity). The end product will be distribution layers, essentially a data compilation, integration, and mapping exercise. The final PICES Scientific Report will include regional spatial summaries, but not include habitat integration or modeling. Data layers will include utilization distributions and/or raster files in formats that can be opened in various formats. We may need to digitize PICES regions and redefine certain regions, *e.g.*, Aleutian and Kurile Island regions. The end product users will be able to use the distribution layers for many purposes, including prey consumption, habitat modeling, marine spatial planning, risk assessment, *etc.* The scale of the data will depend on the survey or device used to collect the data. We will disaggregate data as much as possible (*e.g.*, devices with differing resolutions), and use case studies in smaller areas with good ship-based and tracking survey data overlap to determine the best ways to integrate data (see more detail below). We recognize this is not a product for scientists to conduct fine-scale analyses such as fine-scale nearshore movements.

Many databases already exist for the data that we will use, therefore, we will not duplicate these efforts. Any data that we acquire directly from data holders that is not currently archived in a database, will, with the data holder’s consent, be archived into an existing database. Data provided in raw format will not be archived or distributed without the data holders consent. The final data layers that we produce will be aggregated at a minimum spatial scale acceptable to all data providers. These aggregated data layers will be available for download from the PICES website. Attendees noted the potential to have the final distribution layers available for viewing on a PICES web-based mapping application.

AP-MBM discussed the funding needed to complete objectives of the Activity Plan. Funding is needed to invite speakers to the workshop during PICES-2013. Potential funding sources include PICES for 2 invited speakers, and possibly the North Pacific Research Board to host the workshop and for invited speakers. Funding will be pursued to support a post doc to work on this project. Potential sources of these additional

AP-MBM-2012

funds include a formal proposal for US\$100K or more to the North Pacific Research Board and/or the Office of Naval Research.

AP-MBM then focused discussion on the following objectives of the workshop:

1. Determine an analytical approach to integrate datasets.
2. Identify methods to spatially interpolate data.
3. Determine what environmental data to include for spatial modeling.
4. Determine how regions will be selected if we produce regional analyses/summaries (*i.e.*, PICES regions or establish biologically relevant areas)?

To successfully accomplish these objectives, AP-MBM discussed who should attend the workshop (key data holders, spatial analysts, and/or end product users), the format of the workshop, and data sharing policies.

It was agreed that the workshop should involve 10–12 invited attendees, including specialists in what we discussed as the three most important areas: tracking data (diverse experience, not species-specific), survey data, and statistics/modeling. Potential attendees were identified, including:

1. Data holders and database managers:

- John Piatt: North Pacific Pelagic Seabird Database (ship-based surveys),
- Scott Shaffer: Tracking of Pacific Pelagics (TOPP) seabird data holder,
- Kathy Kuletz: ship-based survey data holder for Alaska region,
- Ken Morgan: at-sea seabird data holder for Canada (Environment Canada),
- Karin Forney: NOAA/SWFSC,
- Dr. Okamura: Fisheries Agency. 2000–2007 database from Japan,
- Pat Halpin: Duke University, OBIS Seemap database,
- Yuri Arthukin, Victor Shuntov, and Alexander Kitaysky, for Russian survey data,
- Russ Andrews (Alaska Sealife Center) and Vladimir Burkanov, for Russian tracking data,
- Andrew Trites, University of British Columbia, pinniped tracking data.

2. Spatial analysts:

- Y. Kanaji: Habitat modeling (non-Baysian) of porpoises,
- Sei-Ichi Saitoh: Satellite remote sensing and marine GIS for habitat modeling of top predators,
- Devin Johnson: Baysian modeling, tracking and survey data, pinnipeds,
- Brett McClintock: modeling, tracking and abundance (density) data, pinnipeds,
- Paul Conn: modeling, survey and abundance data, pinnipeds and cetaceans,
- Jeff Laake: modeling, abundance and survey data, MARK, pinnipeds and cetaceans,
- John Durbin: survey and abundance data, cetaceans,
- Alex Zerbini: survey and tracking data cetaceans,
- Jeremy Sterling: tracking and environmental/oceanographic data, pinnipeds,
- Jarrod Santora: modeling marine bird survey data and implications for defining ecologically important areas,
- Martin Renner: modeling marine bird survey data,
- Elliott Hazen: modeling predator-prey distributions and variability with climate,
- Lynn Thomas: MOCHA, CREMES – state-space modeling,
- Ian Johnson: Dalhousie University – Baysian statistics,
- Ben Best: spatial statistics,
- Patrick O’Hara: modeling marine bird survey data,

3. End product users:

- Francis Weise (or other NPRB representative): Science Director, North Pacific Research Board.

AP-MBM agreed that a 2-day workshop was needed, and that the format would involve a discussion of datasets, analytical techniques, end products, form working groups on Day 1, and Review and testing applications, approaches, data outputs on Day 2. A subsample of all data types will be acquired and analyzed beforehand to maximize group productivity during the workshop. The workshop would also focus efforts on regional case studies to resolve data integration issues. Suggested case studies included:

- Case Study #1: Bering Sea near the Pribilof Islands – vessel at-sea surveys vs. tracking data for fur seals, black-legged kittiwakes, and thick-billed murre.
- Case Study #2: Kuroshio Extension: Japanese Fisheries Agency vessel survey and albatross tracking data. Also continuous plankton recorder (CPR) vessel-based surveys and streaked shearwater geolocator data.
- Case Study #3: California Cooperative Oceanic Fisheries Investigations vessel surveys and tracking of Laysan albatrosses, sharks, tunas, *etc.*
- Case Study #4: California Current with NOAA NMFS rockfish vessel surveys and black-footed albatross and sooty shearwater, pinniped, shark, *etc.* tracking data.

Finally, AP-MBM agreed that data sharing policies would involve a formal sharing agreement, similar to that used by OBIS Seamap, *etc.* In addition, every data holder will need to be contacted to confirm use, even if their data are already archived in a database (unless their data are specified as available for all use without request).

Ultimately, this technical workshop on methodology (including modeling, analysis) to derive “hotspots” of seabird and marine mammal aggregations or diversity is necessary to enhance the science needed to address our focal area of Spatial Ecology and Conservation. The workshop will emphasize methods to synthesize disparate bird and mammal distribution and abundance data (*e.g.*, how to combine tracking and shipboard observations) and key product development, such as the production of maps of important and vulnerable areas based on these distributional data.

AP-MBM Endnote 1**AP-MBM participation list**Members

Kaoru Hattori (Japan)
 Hidehiro Kato (Japan)
 Rolf Ream (USA, Co-Chairman)
 Peter Ross (Canada)
 William Sydeman (USA)
 Andrew Trites (Canada)
 Yutaka Watanuki (Japan, Co-Chairman)

Observers

Steven Bograd (USA)
 John Elliot (Canada)
 Dave Foley (USA)
 Elliot Hazen (USA)
 George Hunt (USA)
 Ken Morgan (Canada)
 Jarrod Santora (USA)
 Robert Suryan (USA)
 Tsutomu Tamura (Japan)
 Atsushi Tsuda (Japan)

AP-MBM Endnote 2

AP-MBM meeting agenda

1. Call to Order – Review Agenda (modify as needed)
2. Introductions - meeting participants, new members of PICES community
3. Reports from participants
 - a) Outcome of the 2011 Session S2 Hot Spot (R. Suryan)
 - b) Report of Workshop W3 2012 (G. Hunt)
 - d) Introduction of Topic Session S6 2012 (P. Ross)
 - c) IWC (H. Kato)
 - d) Link with other groups
4. Discussions
 - a) Review MBM-AP Terms of reference
 - b) Progress of AP Activity Plan, Spatial Ecology and Conservation (R. Suryan)
 - d) Review 2013 session proposal and identify possible participants and speakers Session (W. Sydeman)
 - e) Long term strategic plan; link with FUTURE, other committees, potential workshop, Session
5. Review activities related to the renewed 3-year term of AP-MBM, Spatial Ecology and Conservation and Workshop plan (R. Suryan)

AP-MBM Endnote 3

PICES Observer Report on the 64th IWC Scientific Committee Meeting

Hidehiro Kato

Tokyo University of Marine Science and Technology, Tokyo 104-8477, Japan

The 64th scientific committee meeting (SC) of the International Whaling Commission (IWC) was held in Panama City, Panama, from June 11 to 24, 2012. A total of 102 participants from 30 contracting governments, in addition to 48 invited experts and 5 observers from 5 international organizations (ACCOBAMS, CCAMLR, IUCN, PICES and SPAW) participated at this year's annual meeting. PICES was especially welcomed by the IWC/SC.

For the management of cetacean stocks, which is most important task for the committee, the SC explored improvement of management methods for cetacean stock after enforcement of the commercial whaling moratorium in 1985, and had already agreed with the scientific basis of RMP (Revised Management Procedure) in 1996 through long time endeavors by many scientists. The IWC/SC is continuing work on checking the performance and implementation trial of the RMP for the stocks through after completion of their comprehensive assessments.

Under the IWC/SC, the following sub-committees and working groups have been established:

- Sub-Committee on the Revised Management Procedure (RMP);
- Sub-Committee on Bowhead, Right and Gray Whales (BRG);
- Sub-Committee on In-Depth Assessments (IA);
- Sub-Committee on Other Southern Hemisphere Whale Stocks (SH);
- Standing Sub-Committee on Small Cetaceans (SC);
- Sub-Committee on Whalewatching (WW);
- Working Group on the Implementation Review of Western North Pacific common minke whales (NPM);
- Standing Working Group on an Aboriginal Whaling Management Procedure (AWMP);
- Working Group on DNA (DNA).
- Working Group on Stock Definition (SD);
- Working Group on Estimation of Bycatch and other Human-Induced Mortality (BC);
- Standing Working Group on Environmental Concerns (E);
- Working Group to Address Multi-species and Ecosystem Modelling Approaches (EM);

Every substantial issue is discussed once at the sub-committees or the working group and then goes to plenary of the committee. After completion of its business at its annual meeting, the IWC/SC makes scientific advice and recommendations to the IWC.

This year the following topics were noted:

1. RMP implementation

The IWC/SC focused on general issues such as maximum sustainable yield (MSY) rate and catch limit algorithm (CLA), and specific implementations on the western North Pacific Bryde's whale, western North Pacific common minke whale, North Atlantic fin whale and North Atlantic common minke whale stocks and North Atlantic sei whale stocks. In the North Pacific region, preparations of the implementation were almost done for WNP Bryde's whales but its assessment will be postponed till 2016, and it was the peak of discussion for western North Pacific minke whales in terms of stock structure scenario for the trial.

2. Comprehensive assessment (CA)

Under the comprehensive assessment (CA), this year the IWC/SC continued the review of stock status of blue and humpback whales, and right whales in the southern hemisphere. Also, both east and west stocks of the North Pacific gray whales were highlighted. It was the most highlighted topic and the SC settled the discussion on population abundance of the Antarctic minke whale though there were still unsolved problems on their time trend.

3. Management of aboriginal and subsistence whaling

The IWC/SC has managed ongoing aboriginal and subsistence whaling with using AWMP (Aboriginal and subsistence whaling management scheme), including Bowhead whale stocks in the Arctic region, fin whale, minke whale and humpback whale stocks of west Greenland and humpback whale off St. Vincent and Grenadines and Eastern stock of gray whales of Chukotka. Through examinations of updated scientific information, the IWC/SC concluded the present catch levels for respective stocks would not harm the stocks. However, at the commission level, it was not supported that Denmark proposed minimum increase of catch quota.

4. Western gray whales

The western gray whale stock is noted as a highly depleted stock with a population size of around 120. The IWC/SC received a very interesting report that a Russian-U.S. research team, in cooperation with the IWC/SC, had tagged a large male with a satellite tag in the summer of 2010. It was noted that the animal crossed the Okhotsk Sea, southern parts of Bering Sea, and reached the west coast of North America.

5. Environment issues and ecosystem modeling

For environment issues around cetacean stock management, the IWC/SC has two working groups (E, Environmental concern; EM, ecosystem modeling) and a number of matters related to environmental factors that affect cetaceans were discussed. This year, the following issues were reviewed on the progress of the E Working Group:

1. State of the Cetacean Environment Report (SOCER),
2. Update on POLLUTION 2000+ Phase II, including assessment Oil Spill impacts on cetaceans,
3. Review of Cetacean Emerging and Resurging Disease (CERD),
4. Review of new information on anthropogenic sound,
5. Review of progress on recommendations from the 2nd Climate Change Workshop, and others.

The Ecosystem Modeling Working Group dedicated its time to three general tasks:

- (1) review of ecosystem modeling efforts undertaken outside the IWC;
- (2) explore how ecosystem models contribute to developing scenarios for simulation testing of the RMP; and
- (3) review of other issues relevant to ecosystem modeling within the Committee.

Under item (1), it was noted through reviewing some documents* that with the move toward ecosystem-based management, consumption by marine mammals warrants inclusion as a source of natural mortality in assessments of mammal prey stocks. For item (2), it was emphasized again the value of implementing this in small steps rather than going immediately to complex models, and it was agreed that consideration of simple models of whales and prey should be a priority issue for future meeting. Under item (3), through reviewing the paper on Antarctic minke whale body condition changes to environment effects, it was noted that for an understanding of the possible relationships between food intake and stomach fullness, analyses of the consequences of the diurnal patterns of food intake should be important; alternative models for stomach evacuation (such as linear and exponential models) should be examined.

6. North Pacific Sighting survey cruise (IWC/POWER cruise)

It was agreed the comprehensive cetacean sighting survey project would be commenced in summer 2010 under cooperation between Japan, Republic of Korea and the United State under auspices of the IWC. The project includes line transect sighting for estimating population abundance and biopsy skin-sampling and photo ID for stock structure of major large cetaceans. It was also agreed for years 2011 onwards, that the project will be conducted by the IWC/SC directly as its own middle- to long-term research project. The project was renamed to be “Pacific Ocean Whale and Ecosystem Research (POWER)” project in the last year. It was reported that the 2011 POWER cruise was successfully conducted; it was particularly noted that there were considerable numbers of biopsy and photo ID samples from humpback, fin and blue whales in addition to many sighting of fin and sei whales. (The 2012 POWER cruise has already been conducted from June to September 2012 as scheduled). For 2013 and onwards the cruise will be conducted at lower latitudes between 40°N to 30°N east of 160°E.

A request from PICES on the possibility of a sea-birds sighting survey on the POWER cruise was discussed at the SC meeting for the IWC/POWER project. The SC identified some important scientific aspects in the PICES request; however, it thought it was rather difficult to accept the request at that moment due to logistical reasons, especially as there was limited accommodation for the number of researchers and a time constraint with other research activities.

7. Other issues

The SC also covered relevant issues on small cetaceans, whalewatching, by-catch and humane deduced mortality, *etc.* as in many previous years.

8. Next year’s meeting

The next annual meeting of the IWC/SC will be held at Jeju-do Island, Korea from June 3 to 15, 2013, and the Commission will not meet until some time in 2014.

* details of the paper:

SC/64/EM 1; Link, J.S. An overview of ecosystem models germane to whale population issues. 10pp.

SC/64/EM2; Col, L.A., Link, J.S., Cadrin, S. and Palka, D. Marine mammal (prey) consumption on the northeast US continental shelf. 52pp.

after Kato (2011)

*AP-MBM Endnote 4***Terms of Reference (revised in 2011)**

1. Provide information and scientific expertise to BIO and the FUTURE Program, and, when necessary, to other scientific and technical committees with regard to the biology and ecological roles of marine mammals and seabirds in the PICES region.
2. Identify important problems, scientific questions, and knowledge gaps for understanding the impacts of climate change and anthropogenic factors on MBMs in ecosystems of the PICES region through Workshops, Theme Sessions and Science Reports.
3. Assemble information on the status and key demographic parameters of marine mammals and seabirds and contribute to the Status Reports.
4. Improve collaborative, interdisciplinary research with marine mammal and seabird researchers and the PICES scientific community.

*AP-MBM Endnote 5***Plan of activities (2012–2014)**

Marine birds and mammals (MBMs) are: 1) highly mobile and their movement and distribution are easily observed from above the sea; 2) important marine top predators that consume substantial amounts of forage prey; and, 3) susceptible to the changes in marine food web structure and productivity, and to a variety of anthropogenic impacts, so they are believed to be sentinels of ecosystem health. Incorporating these characteristics of MBMs, and the objectives of FUTURE, we propose Spatial Ecology and Conservation as the topic of priority for AP-MBM 2012–2014 activities. Terms of Reference are revised accordingly (*AP-MBM Endnote 4*). Here we 1) describe the rationale of this topic, 2) summarize related past activities, and 3) describe potential activities or products to be accomplished by AP-MBM during the next three years (the term length for APs in PICES).

Topic summary (2012–2014): Spatial Ecology and Conservation

Leaders: Rolf Ream (USA), Yutaka Watanuki (Japan), Robert Suryan (USA, non-member),

Rationale:

Marine birds and mammals (MBMs) are not distributed evenly and aggregate at various temporal and spatial scales due to physical forces, biochemical factors, patchiness of their prey, behavioral and social factors, and the spatial dynamics of marine ecosystems. Thus coupling their distribution at sea with physical and biological factors is a subject of great interest and importance (Coyle *et al.* 1992, Hunt *et al.* 1993, and many others).

Research on the distribution and movement of MBMs in marine ecosystems can be relatively easy to accomplish and provides useful information for marine spatial planning and management (LME, IBA, IEA, and MPA; Hyrenback *et al.* 2000, Worm *et al.* 2003, Hooker 2008, Louzao *et al.* 2009). Additionally, identification of biological hot spots, where abundance and/or biodiversity are high, and elucidating the mechanisms, through the combination of biological (movement of MBMs and primary production) and physical information, that are responsible for establishing and maintaining (spatial and temporal stability/frequency) the hotspots, is critical for fisheries and conservation of MBM.

Related past activities of AP-MBM:

BIO (AP-MBM) co-sponsored the Topic Session titled, “*Hot spots and their use by migratory species and top predators in the North Pacific*” at PICES-2004. The related papers were subsequently published in Deep Sea Research II (2006). BIO (AP-MBM)/POC co-sponsored the Topic Session titled, “*Mechanisms of physical-biological coupling forcing biological hotspots*” at PICES-2011. Due to advancements in tracking techniques, studies on the movements of MBMs and the factors affecting their distributions have progressed substantially (Pinaud *et al.* 2005, and many others). At-sea bird and mammal census data are also accumulated and analyzed with the aid of new spatial statistics (Louzao *et al.* 2009 for an example).

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Activity plan:

In three years (2012–2014), AP-MBM will: 1) synthesize distribution data of MBMs (boat-based, tracking, and terrestrial surveys) and its temporal change, 2) examine physical and biological factors that correspond to ecological/economic (fisheries) hot spots, and 3) provide information on important ecological areas in the PICES region to facilitate sustainable use of marine resources. These efforts will be useful for identifying important (for productivity, biodiversity, fisheries) and vulnerable (because of climate and anthropogenic impact including fisheries and pollution) ecological areas in the PICES region and to help understand the spatial and temporal dynamics responsible for variable habitat use (*i.e.*, biological hotspots). Knowledge of MBM use of ecological important areas, now and in the future, will contribute to the FUTURE mission of understanding climate change and anthropogenic impacts on marine ecosystems in the PICES region.

Time schedule:

PICES 2012 Annual Meeting (Japan), including a ½-day AP-MBM business meeting and a proposed Topic Session on “*Spatial patterns of anthropogenic stressors: predators as sentinels of marine ecosystem health*” (Co-convenors: P. Ross and Y. Watanuki).

2013 potential inter-session workshop (location to be determined):

A 2-day workshop on methodology of data analysis and modeling of at-sea spatial data, and for standardization of mapping efforts is planned. This workshop would emphasize methods to synthesize disparate bird and mammal distribution and abundance data, and to standardize development of key products, such as an atlas of important and vulnerable areas based on their distributional data. At the PICES 2013 Annual Meeting (Nanaimo, Canada), there are plans for a ½-day business meeting and potential Workshop or Topic Session on “*Modeling changes of distribution and ranges of MBMs in relation to climate change and anthropogenic impact*”.

The PICES 2014 Annual Meeting will include a ½-day business meeting with potential Workshop and Topic Session to synthesize the data and make an atlas of important and vulnerable areas using distribution of MBMs. Proceedings and a PICES Science Report (Ream, Suryan, Watanuki) will follow.

AP-MBM Endnote 6

Proposal a ½-day Topic Session on “*Are marine ecosystems of the North Pacific becoming more variable?*” at PICES-2013

A primary forecast from Global Climate Models (GCMs) is increasing variability in the physical and biological attributes of marine ecosystems (IPCC 2007). It is also well known from oceanography, marine ecology, and fisheries biology that variability is a key attribute to population stability/instability. Increasing spatial and temporal variance has also been hypothesized to be a precursor to long-term marine ecosystem change or “regime shifts”. In this theme session, we invite papers that test hypotheses of increasing marine ecosystem variability relative to global climate change, be they of natural or anthropogenic origins. In particular, we invite studies that (1) address the theoretical basis for variance changes in North Pacific marine ecosystems using global climate models, paleo-ecological data, or experimental evidence, (2) directly test an hypothesis of “increasing ecosystem variability” using observational physical and/or biological data, and (3) consider how human social and economic systems and structures may be affected by increasing ecosystem variability, including the possible need for modifications in conservation and management strategies to deal with greater unpredictability and extremes in ecological conditions. A special volume for the primary literature will be investigated pending sufficient subscription to this session. Alternatively, a meta-analysis/review paper may be developed.

Proposed invited presentations:

- Model predictions of change in North Pacific ecosystem variance/variability (E. Di Lorenzo, USA),
- Paleo-ecological studies of ecosystem variability: the case of coral reefs (J. Pandolfi, Australia),

- Is climate and ecosystem variance altering pulses in recruitment of Northeast Pacific fish (J. Field or A. Hollowed or M. Litzow, USA),
- Managing fisheries for changes in system variance/variability (I. Perry, Canada or T. Essington, USA).

Sponsoring Committees: BIO/FIS/POC

Co-convenors: Steven Bograd (proponent POC/WG 27), Elizabeth Logerwell (proponent FIS), William Sydeman (lead), Yutaka Watanuki (proponent AP-MBM/BIO)

AP-MBM Endnote 7

Proposal for a 2-day Workshop on “Marine bird and mammal spatial ecology” at PICES-2013

Marine birds and mammals (MBMs) are highly mobile, yet relatively easily observed and tracked to determine their spatial distribution throughout the North Pacific Ocean. They are important marine top predators that consume substantial amounts of prey, and are susceptible to changes in marine food web structure, productivity, and to a variety of anthropogenic impacts. Therefore, MBMs are highly visible sentinels of ecosystem health and its change. To incorporate these roles and characteristics of MBMs into ecosystem based management and meet objectives of FUTURE, the PICES MBM Advisory Panel (MBM AP) proposed to focus on MBM spatial ecology and conservation as a priority topic for their 2012–2014 activities.

Over the past several decades, a wide variety of research programs have collected observational and tracking data of MBMs throughout the North Pacific. Portions of these data have been compiled into large databases, such as the North Pacific Pelagic Seabird Database. Others, however, still need to be integrated for more complete coverage of the PICES regions. We propose to hold a workshop to devise a strategy to compile and integrate these various data sets. Workshop invitees will include data holders and spatial analysis experts. Once data are compiled and integrated, our overall objectives will include: 1) synthesize distribution data of MBMs and assess changes over time; 2) examine physical and biological factors that correspond to high use “hot spots”; 3) map and provide information on important ecological areas in the PICES regions. Holding the proposed workshop is an important first step to compiling and integrating these massive datasets. In February 2012, we held discussions with several of the main data holders/contributors and they expressed broad support for this effort.

Sponsoring Committee: BIO

Potential co-sponsors: North Pacific Research Board and other potential co-sponsors.

Convenors:

- Robert Suryan (lead), Oregon State University, Newport, OR, email: rob.suryan@oregonstate.edu
- William Sydeman (proponent APMBM/BIO), Farallon Institute for Advance Ecosystem Research, Petaluma, CA, email: wsydeman@faralloninstitute.org,
- Yutaka Watanuki (proponent APMBM co-chair/BIO), Graduate School of Fisheries Sciences, Hokkaido University, Hakodate, Japan, email: ywata@fish.hokudai.ac.jp,
- Rolf Ream (proponent AP-MBM co-chair/BIO), National Marine Mammal Laboratory, National Marine Fisheries Service, Seattle, WA, email: rolf.ream@noaa.gov.

Potential invited participants: (a maximum of 10 will attend)

- Y. Kanaji: Habitat modeling of porpoise: variability that depends on different statistical techniques,
- Sei-Ichi Saitoh: Satellite remote sensing and marine GIS for habitat modeling of top predator,
- Devin Johnson: modeling, tracking and survey data, pinnipeds,
- Brett McClintock: modeling, tracking and abundance (density) data, pinnipeds,
- Paul Conn: modeling, survey and abundance data, pinnipeds and cetaceans,
- Jeff Laake: modeling, abundance and survey data, MARK, pinnipeds and cetaceans,

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- John Durbin: survey and abundance data, cetaceans,
- Alex Zerbini: survey and tracking data, cetaceans,
- Jeremy Sterling: tracking and environmental/oceanographic data, pinnipeds,
- Jarrod Santora: modeling marine bird survey data and implications for defining ecologically important area,
- Martin Renner: modeling marine bird survey data,
- Elliott Hazen: modeling predator-prey distributions and variability with climate,
- John Piatt: North Pacific Pelagic Seabird Tracking Database,
- Scott Shaffer: Tracking of Pacific Pelagics (TOPP) seabird data holder,
- Daniel Costa: Tracking of Pacific Pelagics (TOPP) marine mammal data holder,
- Kathy Kuletz: ship-based survey data holder for Alaska region,
- Francis Wiese: Science Director, North Pacific Research Board.

Output: Results stemming from this workshop will be published as a PICES Scientific Report at the end of AP-MBM's renewed 3-year term (2011–2014).

The FUTURE Advisory Panel on *Anthropogenic Influences on Coastal Ecosystems*

AP-AICE Chairman, Dr. Thomas Therriault, welcomed the members (*AP-AICE Endnote 1*) and guests to the meeting of the FUTURE Advisory Panel on *Anthropogenic Influences on Coastal Ecosystems* on October 14, 2012, in Hiroshima, Japan.

AGENDA ITEM 1

Introductions and opening remarks

Low participation continued to be an issue for AP-AICE. At this meeting two member countries (China and Korea) and two Committees (BIO and MONITOR) were not represented. Given the structure of the FUTURE program and the reliance on country/Committee contributions to APs, it is essential for this issue to be resolved. It was noted by a participant at the meeting that each country is represented by two to three individuals on PICES Committees and it was questioned why APs have so few members. It was noted that this was intended to permit efficient communication with Committees. However, participation in AP-AICE has been so low that it has affected its ability to fulfill its mandate.

Action: Participation from Drs. Kang, Ro and Sun has been limited and sporadic so they must be replaced. Further, it is recommended that the AP-AICE be expanded to ensure adequate representation and expertise to deal with the wide variety of coastal issues. BIO and MONITOR need to identify an active participant for AP-AICE to ensure Committee representation and connection with the FUTURE program. In addition, MEQ and BIO should consider additional representation (to deal with the wide range of issues facing this AP). Further, representation by S-CCME and S-HD would complement AP-AICE. Lastly, Dr. Kaeriyama who has been an active member since inception representing BIO and Japan will retire in 2013 and thus FIS will need to identify a representative for AP-AICE. It was noted that Dr. Imai will join MEQ in 2013 and could represent Japan on AP-AICE.

AGENDA ITEM 2

Review and adopt agenda

The draft agenda was reviewed and additional issues raised at the joint FUTURE AP Meeting (October 14, 2012) were added to the agenda for discussion including:

- Providing recommendations to Committees on Topic Sessions for the 2013 Annual Meeting;
- Discussion of the inter-sessional FUTURE workshop (with ISB) in 2013;
- Discussion of options, dates, and venue for the FUTURE Open Science Meeting;
- Discussion and population of the FUTURE Road Map, especially FUTURE products and operationalizing the FUTURE program.

The draft agenda (*AP-AICE Endnote 2*) was adopted after the additions.

AGENDA ITEM 3

Potential Topic Sessions for PICES-2013

In general, AP members were happy with the online system of proposals although only about half actually submitted rankings online. There was discussion about potential improvements to consider for next year including:

- Requesting the PICES Secretariat to send more reminders to encourage ranking submissions;

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- having prior information on the potential number of invited speakers (due to financial considerations),
- confirming that co-convenors had agreed to this role;
- clarifying that when submitting a proposal for a topic session or workshop, identifying co-sponsors is intended to identify external organizations participating in the session;
- individual members' rankings should be secret. Some were troubled by seeing all rankings when logging into the system;

It was noted that the result of members' rankings was intended to initiate discussion. APs or Committees can, if they wish, overrule the results of voting during their meetings, so there is still a role for them.

AP-AICE discussed each of the proposed Topic Sessions and Workshops and identified the ones most closely aligned with AICE activities for suggested support via Committees:

- Proposal 4, Logerwell – *Science needs for offshore oil and gas development in the North Pacific*
- Proposal 6, Perry – *Ecosystem indicators to characterize ecosystem responses to multiple stressors in North Pacific marine ecosystems*
- Proposal 13, Ross – *Status, trends and effects of pollutants in coastal ecosystems: Implications for wildlife and humans* (new)
- Although not directly aligned with AICE activities, the AP liked the idea of the proposed workshop by SG-MP that involved local First Nations and AICE supported *Traditional seafoods of the Snuneymux'w First Nation in Nanaimo, British Columbia: Insight into food, social and ceremonial uses*.

AGENDA ITEM 4

FUTURE inter-sessional Workshop

This item was discussed during the Joint AP Meeting and AICE supported the proposed joint P/ICES inter-sessional Workshop to take place in western Russia in May 2013. AP members were encouraged to participate if possible.

AGENDA ITEM 5

FUTURE Open Science Meeting

AICE supported the idea of an Open Science Meeting (OSM) to showcase PICES FUTURE research/products. The AP felt that a central location such as Hawaii, USA, would be convenient and economical for participants on both sides of the Pacific. It was noted that the PICES/GLOBEC CCCC Program had a very successful meeting in Hawaii in 2006.

Given the potential scope of this OSM, and with several FUTURE-related expert groups now active, it seemed that a 4–5 day meeting would be suitable. In addition, the AP discussed how having a meeting that is open to other international organizations/researchers could be a real asset and that in some cases organizations such as ICES, SCOR, IMBER, NPAFC, *etc.* might want to co-convene joint sessions at a PICES FUTURE OSM.

The AP was somewhat concerned about the short period of time until the proposed date of the OSM and recognized the need to confirm details as soon as possible so that key invited speakers and external organizations could be secured and engaged in a timely fashion.

Recommendations:

- The AP recommends that a Steering Committee for the OSM be formed quickly with members from both APs and Committees. This group should bring a final OSM plan to the ISB meeting in western Russia in May 2013 (although sooner would be more desirable, perhaps by e-mail).

- The AP had considerable discussion about how this proposed OSM would contribute to the FUTURE program and identified the need to apply knowledge gained from this meeting to help identify a specific path for the FUTURE program as it enters the second half of its life cycle. A small expert group should be identified to remain at the meeting location (2–3 days) to summarize FUTURE advancements and develop an Action Plan to refine the rest of the FUTURE program and present to Science Board at PICES-2014.

AGENDA ITEM 6

FUTURE roadmap

At the joint AP meeting a draft version of the FUTURE roadmap was presented for discussion. The AP Chair quickly reviewed the major elements of the roadmap and provided some background on developments since the inter-sessional FUTURE Workshop (Busan, Korea, May 24–25, 2012) where this roadmap was initially discussed. Many AICE participants attended the meeting in Busan and were familiar with the general process.

AICE spent considerable time drawing connections between FUTURE products listed in the hard copy of the roadmap provided for discussion and current/potential expert groups and the questions identified in the FUTURE Implementation Plan. Key points of this discussion are captured below but it is important to recognize that additional discussion will be required and the roadmap updated almost routinely if it is to be used to its full potential in implementing the FUTURE program.

There was considerable discussion about the topic of ecosystem resilience and vulnerability, given the prominence of this topic in the FUTURE program, especially under Theme 1. However, there remains a lot of uncertainty about what this means for the implementation of FUTURE. Although the idea of ecosystem resilience is not new, it remains poorly understood, if not ill defined, at least for PICES applications. For FUTURE to address Theme 1 adequately, additional guidance/clarification on ecosystem resilience and vulnerability is needed. Thus, PICES will need to consider the development of a new expert group to address this topic. Although it is premature to recommend a new expert group to Science Board at this meeting, PICES needs to plan for the creation of this group, potentially as early as the 2013 Annual Meeting in Nanaimo. Perhaps a Study Group could conduct a review of ecosystem resilience and vulnerability to provide a gap analysis on what would be required to implement this element of FUTURE. The AP discussed potential sources of information in conjunction with noted major ecosystem shifts such as the change in Eastern Canada from a cod dominated ecosystem to a crab/shrimp dominated one. In addition, a retrospective-type analysis could be conducted to look at ecosystem shifts in response to major stressors (*e.g.*, aquatic invasive species, overfishing, climate change). Ultimately, AICE feels that a Working Group on ecosystem resilience and vulnerability will be needed in PICES.

Several elements of FUTURE Theme 2 are being addressed by newly created expert groups but its scope and scale could pose major challenges when trying to generalize or synthesize. Question 2.1 can be addressed with time series of status and trend indicators (see below on NPESR). Similarly, Question 2.4 could be addressed by new indicators being developed by WG 28 and S-HD, Question 2.6 could be addressed by various climate model outputs from either WG 27, WG 29 and/or S-CCME. Lastly, in order to address Question 2.7, an analysis of what goods and services are being affected by ecosystem change will be needed to properly address how societies are affected by these changes.

FUTURE Theme 3 is very relevant to AICE (and S-HD). The AP discussed some of the probable indicators of change in response to multiple stressors being developed by WG 28 that should address much of Question 3.1 and potentially most of Question 3.3. However, the current suite of PICES expert groups is not able to address much, if any, of Question 3.2. Much more work will be required to address Question 3.4. The group discussed the need to better understand the linkages between coastal ecosystems and terrestrial and offshore systems, especially in the context of anthropogenic stressors. Although S-HD is just getting underway within PICES, this expert group will contribute substantial information in support of Question 3.5. For example, it is

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expected that this group will be able to identify thresholds for when management intervention should take place and identify mechanisms to apply risk-based approaches to fisheries/ecosystem management.

AICE discussed what should be added or considered for the next edition of the North Pacific Ecosystem Status Report. Ideally a suite of ecosystem indicators can be identified by WG 28 but a mechanism is required to insure that these would be generated beyond the 3-year lifespan of a Working Group. Thus, it seems reasonable that this task could be undertaken by PICES Committee(s) or an *ad hoc* group tasked with this.

The human dimension of ecosystem change is becoming an increasingly timely topic within PICES and elsewhere and it would be desirable to see some related indices in the next NPESR.

Although critical biological/environmental data are available within existing NPESR reports, it would be beneficial to identify what critical/key data are needed (in part to generate potential indices but also as stand alone pieces of information) and identify a mechanism to ensure these are available when needed in a sustainable way. The means to take an aggregate view of time series across ecosystems for nutrients, temperature, salinity, dissolved oxygen, carbon, chlorophyll, zooplankton, biomass (including changes in productivity/distributions), *etc.* is needed. By standardizing variables it will be easier to make cross-ecosystem comparisons.

AGENDA ITEM 7

Expert group activities relevant to AICE

At the Joint AP meeting, almost all expert groups relevant to FUTURE made presentations. This allowed all AP members to hear the common message about progress, issues, and results. There were no AICE-specific issues that were raised during the AP-AICE meeting.

AGENDA ITEM 8

AICE Action Plan

It was unclear if an AICE-specific Action Plan was required. No plan was developed in advance of this meeting and time constraints prohibited extensive discussion of this.

AGENDA ITEM 9

Identification of high priority topics for FUTURE and potential mechanisms to address these

AICE discussed the need for additional membership to better advance AP discussions/issues/recommendations (see Agenda Item 1). The AP suggested that there is considerable work still required to make the FUTURE roadmap operational. Thus, continuing to establish connections/linkages within the roadmap should be a priority for any inter-sessional activities.

AGENDA ITEM 10

Linkages to other FUTURE-APs, Committees and PICES scientists

The presentation that was developed by the three FUTURE AP Chairs provided a common, consistent message to Committees and seems to have improved the relationship between FUTURE APs and Committees. Additional participation from Committee members at the Joint AP Meeting would strengthen this relationship.

AGENDA ITEM 11

Membership and rotation of FUTURE AP Chairs

At PICES-2009, Science Board determined that the term of an AP Chair should be 3 years, except for the initial appointments that would extend and be staggered to avoid simultaneously replacing all chairmen after 2012. At ISB-2012, Science Board decided that SOFE Chairman, Robin Brown, would be replaced after PICES-2012. The AICE and COVE Chairmen would be replaced in subsequent years. No specific decision was made about the next potential AP-AICE Chair and no volunteers were forthcoming.

AP-AICE Endnote 1**AP-AICE participation list**Members

Thomas Therriault (Canada, Chairman; MEQ)
Igor Shevchenko (Russia; TCODE)
Steven J. Bograd (USA; POC)
Masahide Kaeriyama (Japan; FIS)

Absent

Young Shil Kang (Korea)¹
Young-Jae Ro (Korea)
Song Sun (China)

Observers

Toyomitsu Horii (Japan)
Katsuyuki Abo (Japan)
Yoichiro Ishibashi (Japan)
Karin Baba (Japan)
Hideaki Maki (Japan)
Suam Kim (Korea)
Darlene Smith (Canada)

¹ Notified in advance

AP-AICE Endnote 2**AP-AICE meeting agenda**

1. Welcome, introductions, opening remarks
2. Review and adopt agenda
3. Potential Topic Sessions at 22nd Annual PICES Meeting, Nanaimo (2013)
4. Potential inter-sessional FUTURE meeting with ICES (Spring 2013)
5. FUTURE Open Science Meeting in 2014
6. Discussion of FUTURE roadmap from Busan ISB meeting
7. Review and discuss expert group activities relevant to AICE
 - a. WG 28
 - b. S-CCME
 - c. S-HD
 - d. others
8. Develop/Review AICE Action Plan
9. Identification of high priority topics for FUTURE and potential mechanisms to address these (AP activities, national programs, symposia, new Ex Groups, *etc.*)
10. Linkages to other FUTURE-APs, committees and PICES scientists
11. Membership, rotation of FUTURE AP Chairs
12. Implementing FUTURE, developing a plan for AICE-AP
13. Other issues (Roundtable)

The FUTURE Advisory Panel on *Climate, Oceanographic Variability and Ecosystems*

The FUTURE Advisory Panel on *Climate, Oceanographic Variability and Ecosystems* (AP-COVE) held its fourth meeting from 14:00–17:15 on October 14, 2012, in Hiroshima, Japan. AP-COVE chairman, Dr. Hiroaki Saito, welcomed the 5 members (*AP-COVE Endnote 1*) and guests to the meeting. The draft agenda (*AP-COVE Endnote 2*) was reviewed and agreed upon.

AGENDA ITEM 2

Changes to, adoption of, agenda

The agenda was adopted without changes.

AGENDA ITEM 3

Expert group activities relevant to COVE

a. WG 29 on *Regional Climate Modeling*

Comments/suggestions: COVE would like to see a roadmap of activities that will allow WG 29 to be able to downscale biogeochemistry. COVE requested guidance on whether downscaling biogeochemistry is appropriate or if regional data should be used in specific relationships, and when the downscaled biogeochemistry will be available for zooplankton output. COVE suggested that collaboration with S-CC on their O₂ database may be useful in developing an O₂ model in WG 29.

b. WG 27 on *North Pacific Climate Variability and Change*

Emerging questions and activities: What are the forcing dynamics that modulate the eddy fields? What are the changes in forcing dynamics predicted by IPCC climate models? What are the controls and mechanics of oxygen variability?

Future activities include: combining observations and ocean models; identifying the different-scale dependent regional climate controls on ecosystem variability; developing process models to hindcast and forecast regional oxygen and time series of marine population variability.

Comments/suggestion: WG 27 is well organized and is following the Terms of Reference well. COVE can expect ToR output.

c. S-CCME, Section on *Climate Change Effects on Marine Ecosystems*

Comments/suggestions: Since S-CCME is dependent on the activities of many expert groups, there needs to be face-to-face dialogue for progress or for defining requirements. This might be useful to avoid unnecessary overlap between activities of S-CCME and other expert groups. It would be helpful to have S-CCME meetings when other expert groups are not meeting because many of S-CCME's members are also the members of these expert groups and the face-face dialogue or personal connections cannot be maintained if they have to be present at these other meetings. It would be useful to the communication between S-CCME and other expert groups to prepare a table of understanding, forecasting, and application with linkages of PICES expert groups.

d. S-CC, Section on *Carbon and Climate*

Analysis and synthesis of historical data; analysis of climate model projections and evaluation against observations. Observations and projections of changes in open ocean O₂ and CO₂ are needed to help separate local from larger-scale influences.

Comments/suggestions: Since transport dynamics is a topic that recurs in different expert groups, it would be

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worthwhile to have a cross-cutting meeting at the next PICES Annual Meeting to have informal discussions on these recurrent topics.

e. WG 28 on *Ecosystem Responses to Multiple Stressors*

Comments/suggestions: The web-based survey of experts on habitats vulnerable to important multiple stressors was carried out by WG 28 in a successfully. It collected data for understanding the priorities of each PICES member country.

AGENDA ITEM 4

COVE related national/regional projects

AP-COVE compiled a list of relevant national projects (*AP-COVE Endnote 3*) which will be posted on the COVE or FUTURE website to make it easy for PICES and non-PICES scientists to get information on what COVE-related activities are occurring in each PICES member country.

AGENDA ITEM 5

Identify potential for new expert groups to address COVE-AP priorities

Continuous climate research activity is important for PICES and FUTURE after the termination of WG 27. Resilience is an important remaining issue of FUTURE.

Comments/suggestions: COVE suggests inviting Dr. Buzz Holling (Canada), a specialist on ecosystem resilience, to the next joint FUTURE AP meeting at PICES-2013 in Nanaimo, Canada, to have dialogue about moving forward with ecosystem resilience as it relates to FUTURE's Science Plan.

AGENDA ITEM 6

Discussion of FUTURE roadmap from Busan inter-sessional meeting

The FUTURE roadmap, developed at the inter-sessional FUTURE Workshop in Busan, Korea (May 24–25, 2012) was discussed in the joint AP meeting. There was no additional input from members.

AGENDA ITEM 7

FUTURE-related sessions at PICES-2013

Topic Sessions and workshops were proposed through a new web-based submission system prior to the Annual Meeting. Having all the workshop and Topic Session proposals ahead of The Annual Meeting enables FUTURE to have input. COVE will not consider proposals that are submitted after the deadline unless it is of high importance to COVE activities. High priority proposals of COVE were selected for the discussion between FUTURE AP Chairs in which they would select appropriate proposals to move FUTURE forward.

AGENDA ITEM 8

FUTURE OSM in 2014

COVE Recommendations:

- Have a social event for early career scientists so they can begin to network.
- Ensure that there is at least one (if not two) early career scientists as an invited speaker.
- PICES should establish a practice that each session has one early career scientist as a co-covonor.
- PICES could try to use the special funds of APN (Asia Pacific Network) that have been set aside for early career scientists' travel.

AGENDA ITEM 9

Develop/review COVE Workplan

All the AP-COVE members agreed on the proposed Workplan (*AP-COVE Endnote 4*).

AGENDA ITEM 10

Linkages to other FUTURE-APs, Committees and PICES scientists

AP-COVE was pleased with Joint FUTURE AP meeting attendance from PICES Standing Committees and scientists. COVE found it helpful to have it scheduled ahead of the separate AP meetings. COVE appreciated having an invitation from the Committees to provide FUTURE AP feedback at their meetings.

AGENDA ITEM 11

Membership

Attendance of COVE members to AP meeting has been high consistently, and e-mail discussions prior to, or between, meetings are active. The Chair did not have any issues with a membership, and all members agreed to continue their voluntary support of COVE activities.

AGENDA ITEM 12

Other issues

None.

AP-COVE Endnote 1

AP-COVE participation list

Members

Liqi Chen (China)
Emanuele Di Lorenzo (USA)
Jung-Hoon Kang (Korea)
Jacquelynn King (Canada)
Hiroaki Saito (Japan, Chairman)
Toru Suzuki (Japan)

AP-COVE Endnote 2

AP-COVE meeting agenda

1. Welcome, introductions, opening remarks
2. Changes to, adoption of, agenda
3. Review and discussion of COVE related ExGs activity
 - a. New WG 29 on *Regional Climate Modeling*
 - b. WG 27 on *North Pacific Climate Variability and Change*
 - c. S-CCME Section on *Climate Change Effects on Marine Ecosystems*
 - d. S-CC Section on *Carbon and Climate*

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- e. WG 28 on *Ecosystem Responses to Multiple Stressors* (AICE)
- 4. Review and discussion of COVE related national/regional projects
- 5. Identify potential for new expert groups to address COVE-AP priorities
- 6. Discussion of FUTURE Road Map from Busan ISB Meeting
- 7. FUTURE-related sessions at PICES-2013 (Nanaimo)
- 8. FUTURE OSM in 2014
- 9. Develop/Review COVE Workplan
- 10. Linkages to AICE and SOFE, committees and PICES scientists
- 11. Membership
- 12. Other issues

AP-COVE Endnote 3

List of Relevant National Projects

Project	Funding agency/country	Duration	Contact	Purpose	web
ACCASP (Aquatic Climate Change and Adaptation Services Program)	DFO, Canada		R. Brown	Annually funded projects that investigate climate change impacts to maritime sectors and fisheries, sustainable ecosystems, and safe and secure waters	http://www.dfo-mpo.gc.ca/science/oceanography-oceanogrphie/accasp/index-eng.html
NEPTUNE Canada	UVic, Canada		K. Juniper K. Moran	Continental shelf and offshore cabled observatory system	http://www.neptunecanada.com/
Nereus	Nippon Foundation Japan/UBC, Canada	2010-2019	V. Christensen	Simulating the future ocean - develop scientifically credible simulations of future fish populations and policy options for the world oceans; developing research capacity and international cooperation, raising public awareness of the state of the oceans.	http://www.nereusprogram.org/content/about-nf-ubc-nereus-%E2%80%93-predicting-future-ocean
Assessment of the climate impact on the South Sea ecosystem	China	2008-2013	(J. Zhang, J.G. Fang, T. Xiao, D.J. Huang, S.M. Liu)	Understanding the effects of climate/marine environment changes (global warming, acidification) and predicting the future changes on ecosystem structure and function	
Sustainability of Marine Ecosystem Production under Multi-stressors and Adaptive Management	Korea	2011-2015		Impact of external forcings (Multi-stressors) from climate change and anthropogenic perturbations on the marine ecosystems. Responses of marine ecosystem and change in function and services	

POSEIDON (Northwestern Pacific Ocean Study on Environment & Interactions bw Deep Ocean & marginal seas)	Korea	2006-2015		To suggest the best scenario for 2030 in association with the climatic impacts by examining and configuring the correlation between the Northwestern Pacific and the marginal seas	http://east-1.snu.ac.kr/intro/index.php
YES Cold Water (The study on the impact of the Yellow Sea Bottom Cold Water Mass to the ecosystem)	KORDI, Korea	2012-2014	Woong-Seo Kim, Seok Lee, Se-Jong Ju, Jung-Hoon Kang	To better understand effects of cold water mass on the ecosystem by investigating temporal and spatial variation in structure and dynamics of planktonic trophic components in the Yellow Sea Bottom Cold Waters in the Yellow Sea	-
KOREA EAST-1 (East Asian Seas Time Series)	Korea	2006-2015	K.-I. Chang, T. Lee, C. K. Kang, K.-R. Kim	Identify, quantify, and model the dynamic processes governing the climate variability and their linkage to changes in marine ecosystems	
SKED (The study of Kuroshio Ecosystem Dynamics for Sustainable Fisheries)	MEXT, Japan	2011-2021	H. Saito (FRA)	Understanding the mechanisms of high fisheries productivity from oligotrophic Kuroshio ecosystem	http://tnfri.fra.affrc.go.jp/kaiyo/sked/english/index.html
NEOPS (New Ocean Paradigm on its Biogeochemistry, Ecosystem and Sustainable Use)	MEXT, Japan	2012-2017	K. Furuya (U. of Tokyo)	Developing new ocean provinces based on BGC and ecosystem studies for sustainable use of marine ecosystem services. Half natural sciences, half social sciences.	http://ocean.fs.u-tokyo.ac.jp/
"Hot spot" in the climate system	MEXT, Japan	2010-2015	H. Nakamjura (U. Tokyo)	Extra-tropical air-sea interaction under the East Asian monsoon system	
Tohoku Ecosystem-Associated Marine Science	Mext, Japan	2011-2020	A. Kijima, K. Kogure, H. Kitazato	Understanding the perturbation damage by 3.11 Tsunami in the coastal ecosystems in Tohoku, Japan	http://www.i-teams.jp/
IMBER Hakuho-Maru cruise	various funding	2012	H. Ogawa H. Saito	Meridional transect cruise of N. Pacific (E160) on BGC and Ecosystem	

Evaluation, Adaptation and Mitigation of Global Warming in Agriculture, Forestry and Fisheries	MAFF, Japan	2010-2015	H. Kidokoro (FRA)	Forecasting and mitigation of the impact of global warming on marine ecosystems.	
Comprehensive Study of the Far Eastern Seas of Russia and Northern Pacific	Ministry of Economic Development and Russian Academy of Sciences, Russia	2011-2013	V. Lobanov (POI FEB RAS)	Comprehensive study of properties and dynamics of water, atmosphere and lithosphere, their interactions, including process in coastal zone, to understand their influence on climate and formation of biological, mineral and energetic resources and enhance effectiveness of marine activity and protect environment of the Far Eastern Seas and Northwestern Pacific	
Integrated investigations of ecosystems and biological resources of the Far Eastern Seas of Russia	Committee on Fisheries, Russia	2012-2016	O. Katugin (TINRO)	To understand status and variability of fisheries resources of the northwestern Pacific and its marginal seas and make assessment for sustainable fishery	
POBEX (Pacific Ocean Boundary Ecosystems)	NSF, USA		E. Di Lorenzo	investigating the mechanisms of climate-related variability in three Pacific boundary ecosystems: Gulf of Alaska, California Current System, the Humboldt or Peru-Chile Current System, the Kuroshio-Oyashio Extension (KOE) region	http://www.pacific-ecosystems-climate.org/index.html
CIMEC (The Cooperative Institute for Marine Ecosystems and Climate)	NOAA, USA		D. Checkelely	To better serve the Nation's needs through observing and understanding the marine ecosystems and climate in the California Current System, Eastern Tropical Pacific, Southern Ocean, and globally.	http://cimec.ucsd.edu/index.html

POBEX (Pacific Ocean Boundary Ecosystems)	NSF/NOAA, USA		E. Di Lorenzo	Investigating the mechanisms of climate-related variability in three Pacific boundary ecosystems: Gulf of Alaska, California Current System, the Humboldt or Peru-Chile Current System, the Kuroshio-Oyashio Extension (KOE) region	http://www.pobex.org
Understanding the spatial and temporal variability of dissolved oxygen through a hierarchy of models	NSF, USA	2009-2013	C. Deutsch, T. Ito	Developing a hierarchy of models to understand observed variability of oxygen in the North Pacific and its relation to physical and biogeochemical processes	
The history and future of coastal upwelling in the California Current	NSF, USA	2012-2012	W. Sydeman, S. Bograd	Using historical time series and climate models to evaluate changes in the intensity and timing of upwelling in the California Current System	
Multi-Scale Modeling	NSF, USA		E. Curchitser	Assessing the role of eastern boundary upwelling regions and their ecosystems on climate variability using a fully coupled model	
BEST Synthesis	NSF, USA		E. Curchitser	The variable transport of pollock eggs and larvae over the Bering shelf: A marriage of physics and biology	

*AP-COVE Endnote 4***AP-COVE Workplan****Mission of FUTURE AP-COVE**

The Advisory Panel on *Climate, Oceanographic Variability and Ecosystems* (AP-COVE) is focused on regional (shelf) to basin-scale ecosystem processes and Pacific basin teleconnections. Even though COVE will keep all FUTURE key questions in mind while pursuing its activities, the purview of COVE is mainly the key questions (2) How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future? and (1) What determines an ecosystem's intrinsic resilience and vulnerability to natural and anthropogenic forcing?

COVE associated expert groups (2012):

On-going expert groups

- WG 27: WG on *North Pacific Climate Variability and Change* (2011–2014)
- WG 29: WG on *Regional Climate Modeling* (2011– 2014)
- S-CC: Section on *Carbon and Climate* (2005–2013)
- S-CCME: Section on *Climate Change Effects on Marine Ecosystems* (2011–2020)
- WG 28: *Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (June 2011–2014; Mainly associated with AP-AICE)
- AP-MBM: Advisory Panel on *Marine Birds and Mammals* (1999-2014)

Relevant expert groups (now disbanded)

- WG 20: WG on *Evaluation of Climate Change Projections*
- WG 22: WG on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific*
- WG 23: WG on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim*

Workplan 2012–2013

1. Review the activities of on-going COVE related expert groups at PICES-2012;
2. Provide advice on revising the ToRs for COVE-related expert groups with terms that extend beyond 2012, as needed from PICES-2012 – ISB-2013;
3. Work with Committee Chairs to develop new working groups during PICES-2012/PICES-2013;
4. Develop a plan for the FUTURE workshop in St. Petersburg 2013 with AICE, SOFE and Committees. PICES-2012 – Feb.-Mar. 2013
5. Develop a plan for the FUTURE OSM in 2014 with AICE, SOFE and Committees. PICES-2012/PICES-2013;
6. Review progress toward COVE workplans and update as needed. PICES-2012/ISB-2013;
7. Confirm the membership of AP-COVE. PICES-2012;
8. Initiate reviews and synthesis of information to address FUTURE goals. PICES-2012/PICES-2013.

The FUTURE Advisory Panel on *Status, Outlooks, Forecasts and Engagement*

The *Status, Outlooks, Forecasts and Engagement* Advisory Panel (AP-SOFE) met on October 14, 2012 from 14:00 to 18:00 hours, following the joint FUTURE meeting, in Hiroshima, Japan. The Chairman, Mr. Robin Brown, welcomed members and observers (*AP-SOFE Endnote 1*). Several changes were made to the draft agenda and the revised agenda was adopted (*AP-SOFE Endnote 2*). Terms of reference are provided in *AP-SOFE Endnote 3*.

AGENDA ITEM 3

Topic sessions for PICES-2013

AP-SOFE members reviewed and ranked the proposed Topic Sessions using the web application on the PICES website. At its meeting, the Panel discussed the sessions and rankings and forwarded its final selection to Science Board. SOFE members found the proposed Topic Sessions to be well aligned with the theme “*Communicating forecasts, uncertainty and consequences of ecosystem change*” and with the FUTURE program. Some concerns were raised at the appearance of new proposals for Topic Sessions at the Annual Meeting, as AP members did not have time to give these their full consideration.

AGENDA ITEM 4

Review progress and reports of key expert groups

AP-SOFE reviewed the progress of several key expert groups formed since PICES-2011:

- Section on *Human Dimensions* (S-HD),
- Section (with ICES) on *Climate Change on Marine Ecosystems* (S-CCME)
- Working Group 29 on *Regional Climate Modeling* (WG 29)
- Working Group 27 on *North Pacific Climate Variability and Change* (WG 27)

This was a relatively large number of expert groups to form in a single year, but this assemblage filled some critical gaps in the FUTURE program. AP-SOFE noted that the inter-sessional meeting proposed for Russia in 2013 will provide an excellent opportunity for joint ICES/PICES activities under S-CCME.

Additionally, AP-SOFE reviewed activities of Working Group 28 on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* and was pleased to see the progress on this difficult issue.

AP-SOFE supported the proposal for a new Section on ‘Marine Pollution’.

AGENDA ITEM 5

FUTURE roadmap from Busan inter-sessional meeting (extension from Joint FUTURE AP Meeting)

AP-SOFE strongly supports the continued progress on the FUTURE “Roadmap” developed at the inter-sessional FUTURE Workshop in Busan, Korea (May 24–25, 2012). This is reflected in the AP-SOFE Workplan (*AP-SOFE Endnote 4*).

AGENDA ITEM 6

Inter-sessional FUTURE workshop with ICES (Spring 2013)

AP-SOFE strongly supported the inter-sessional meeting and workshop proposed for western Russia in the spring of 2013 and noted that this will be a key opportunity for joint ICES/PICES collaboration on a major theme for FUTURE.

AP-SOFE-2012

AGENDA ITEM 7

FUTURE Open Science Meeting in 2014

AP-SOFE supported the proposed Open Science Meeting to take place in 2014, with an agenda that is matched to the FUTURE Implementation Plan. The OSM must achieve a balance between the scientific objectives of new understanding (COVE and AICE) and those aspects of FUTURE that are related to outreach and policy (SOFE). With respect to some of the most difficult components of the Implementation Plan (Forecasts, Outlooks and Uncertainties), the AP recommended that SOFE solicit contributions that outline progress/successes as well as the challenges faced.

AGENDA ITEM 8

Implementing FUTURE and developing a plan for AP-SOFE

The AP developed a workplan for SOFE (*AP-SOFE Endnote 4*).

AGENDA ITEM 9

Membership, rotation of FUTURE AP Chairs

Dr. Phillip Mundy (USA) was elected as Chairman of AP-SOFE, replacing Mr. Robin Brown (Canada). Although it was not discussed at the SOFE meeting, in subsequent Standing Committee meetings during PICES-2012, recommendations were made to add two new members to SOFE: (1) Dr. William Peterson (USA) as a representative from BIO, and Dr. Lei Zhou (China) as a representative from POC.

AGENDA ITEM 10

Other issues

None.

SOFE-AP Endnote 1

AP-SOFE participation list

Members

Harold (Hal) Batchelder (USA)
Robin Brown (Canada, Chair)
Shin-ichi Ito (Japan)
Oleg Katugin (Russia)
Phillip Mundy (USA)
William Peterson (USA)

Observers

Mitsutaku Makino (Japan)
Naesun Park (Korea)
Sinjae Yoo (PICES)

SOFE-AP Endnote 2

AP-SOFE meeting agenda

1. Welcome, introductions, opening remarks
2. Review and adopt agenda
3. Potential topic sessions at 22nd Annual PICES Meeting, Nanaimo (2013)
4. Review and discuss expert group activities relevant to SOFE

5. Discussion of FUTURE roadmap from Busan inter-sessional meeting (extension from Joint FUTURE AP Meeting)
 - Report from inter-sessional meeting attached and posted to http://www.pices.int/members/advisory_panels/SOFE-AP.aspx
6. Potential inter-sessional FUTURE workshop with ICES (Spring 2013)
7. FUTURE Open Science Meeting in 2014
8. Implementing FUTURE, developing a plan for AP-SOFE
 - Develop/review SOFE Action Plan
 - Identification of high priority topics for FUTURE and potential mechanisms to address these (AP activities, national programs, symposia, new Expert Groups, *etc.*)
 - Linkages to other FUTURE APs, Committees and PICES scientists
9. Membership, rotation of FUTURE AP Chairs
10. Other issues (Roundtable)

SOFE-AP Endnote 3

AP-SOFE Terms of reference

1. Establish a list of specific FUTURE priority topics, activities and products for review by the Science Board;
2. Work with the existing expert groups associated with FUTURE to review and revise, if needed, their Terms of Reference;
3. Work with the Scientific and Technical Committees and the PICES community to identify gaps in the priorities and activities of the expert groups and to provide recommendations to the Science Board;
4. Coordinate with the Scientific and Technical Committees in developing Terms of Reference for new expert groups to be part of FUTURE;
5. Coordinate with the Editors of the next version of the North Pacific Ecosystem Status Report and advise on how the Report should be updated in the future.
6. Work with the Communication Study Group and the Study Group on Human Dimensions of Environmental Change to commence the review of user characteristics for FUTURE products.
7. Recommend expert groups to identify major sources of uncertainty and impediments to improving the skill of assessments and forecasts, suggest research areas for priority development, and provide coordination of potential PICES products.
8. Provide for a PICES final peer review on information and interpretations

Note: Terms of Reference 1–4 are common to all FUTURE Advisory Panels; Terms of Reference 5–8 are specific to SOFE only.

SOFE-AP Endnote 4

SOFE-AP Workplan for 2012–2013

1. Clearly identify all SOFE-related output products from Expert Groups, based on the Roadmap. This should include details on the output product (What is it?), timing for production and format (Scientific Report; Special Publication; Brochure; presentation; Database). Any potential issues regarding access or storage should be coordinated with TCODE.
2. With this information in hand, develop a simple spreadsheet or database to track progress of FUTURE products.
3. Assist in the planning and development of the FUTURE Open Science Meeting
4. Plan for publication and outreach components of FUTURE products, as identified above.
5. Work with the Section on Human Dimensions on the identification of clients or target groups for FUTURE products in each PICES nations.

AP-SOFE-2012

- It may be possible to get assistance from Governing Council member in this area. Many agencies will have lists of key client groups that they use to direct national outreach/engagement/consultation activities.
- 6. (With MONITOR and other Expert Groups) Refine/design the next version of the North Pacific Ecosystem Status Report. In particular, this will require consultation with S-HD on socio-economic indicators and WG 28 on ecosystem indicators)
- 7. Review requirement for a brochure summarizing the results of Working Group 20 – Climate Projections, drawn from the final report. Produce brochure if deemed valuable.
- 8. (With Expert Groups) Review Terms of Reference for these groups with the goal of embedding requirements for outreach/engagement products in these ToRs, as appropriate. Update Chairman’s handbook to reflect this new requirement for all Expert Groups.
- 9. Assist host country in arrangements for a public lecture at PICES-2013

Summary of Scientific Sessions and Workshops

Science Board Symposium (S1)

Effects of natural and anthropogenic stressors in the North Pacific ecosystems: Scientific challenges and possible solutions

Co-convenors: *Sinjaee Yoo (SB), Atsushi Tsuda (BIO), Elizabeth Logerwell (FIS), Hiroya Sugisaki (MONITOR), Kyung-Il Chang (POC), Toru Suzuki (TCODE), Thomas Therriault (AICE), Hiroaki Saito (COVE), Robin Brown (SOFI), Igor Shevchenko (Russia), Fangli Qiao (China)*

Background

Human society depends on ocean ecosystems to meet many of its needs. The availability of marine ecosystem services to humans is important to sustain coastal communities and to ensure human health and well-being. Global warming, shoreline development, pollution, eutrophication, overfishing, non-indigenous species, and intensive mariculture are examples of anthropogenic stressors that affect marine ecosystems. These stressors can act alone or in combination to alter the structure, function, and productivity of marine ecosystems. Consequently, the potential for decline in the ability of the ocean to provide essential ecosystem services, as a result of synergies in natural and anthropogenic stressors, is a serious concern for human society. To advance ecosystem-based management and to mitigate the influence of stressors, there is a need to develop improved understanding of the mechanisms of change in marine ecosystems. Improved understanding of ecosystem structure, function, and resilience will aid the development of practical methods to maintain and monitor ecosystem health. These are challenging issues for marine science and PICES will continue to promote research to address these issues through FUTURE.

Summary of Presentations

This session was a departure from common themes explored in PICES meeting. It was well-attended and there was a great diversity of presentations, featuring many different ecosystems and at many different scales – from basin-wide impacts to intertidal and subtidal zones of bays and estuaries.

In his Keynote Lecture, Dr. Tokio Wada presented an overview of impacts (and recovery from) the Great East Japan Earthquake, which led nicely to some of the more detailed presentation in this session. Dr. Wada showed that major impacts to intertidal and subtidal zones were observed, but recovery seems to be rapid. In contrast, no significant changes in the migration and distribution of fishes were noted on the offshore areas after the earthquake. Radioactivity in seawater declined rapidly, and levels in most marine biota decreased rapidly, with a biological half-life of 50–140 days, but there are some areas where concentrations in sediment and some benthic species remain high. Dr. Wada concluded by noting the critical importance on longer term monitoring of the recovery, particularly in the coastal zone.

Dr. Hans Paerl and collaborators reported on the work of SCOR WG 137 on global patterns of phytoplankton dynamics and in coastal ecosystems, requiring the “teasing apart” of anthropogenic impacts (very large in some coastal ecosystems) from climate change impacts. These studies highlight the importance of understanding both the quality (species composition) and quantity (biomass) of coastal primary production. These changes also need to be evaluated in light of other factors, including grazing and in some cases, invasive species.

Dr. Ben Halpern reported on a global Ocean Health Index for assessing the condition of both the natural and human dimensions. This index has a “benefits to people” or ecosystem services focus. The Ocean Health Index has some key characteristics of good indices – it is consistent, transparent, quantitative and applicable at various scales. Additionally, it responds to management actions and allows for a variety of societal choices to achieve a given score of the index.

Session Summaries-2012

Dr. William Li (co-authored with Nancy Shackell) reviewed predictions made 25 years ago about the potential future trend in the Northwest Atlantic. They demonstrated how changes in the Arctic propagated down to temperate latitudes. They highlighted the complexity of ecosystem interactions and challenges in predicting ecosystem outcomes from mechanistic understanding of physical/chemical forcing.

Dr. Ian Perry (co-authored with Diane Masson) presented results from a study on an enclosed inland sea – the Strait of Georgia. This was a good treatment of both natural and anthropogenic drivers in explaining the changes in ecosystem status. The use of a variety of models and tools to develop future scenarios was demonstrated.

Dr. Kitack Lee and co-authors demonstrated the importance of atmospheric deposition of nitrogen in changing the nutrient regime of East Asian marginal seas, as a result of their position “downstream” of densely populated and industrialized Asian continent.

Dr. Anne Hollowed outlined a fairly complete and complex implementation of the Ecosystem-Based Management approach for Bering Sea pollock, but pointed out that this implementation may well reduce the resilience of the fishery to adapt to climate change. This highlighted the need to evaluate future harvest strategies within the context of multiple stressors and constraints.

Dr. Yury Zuenko provided a very interesting example of how climate change (weakening of winter monsoon) reduced primary production but this did not result in declines in production at higher trophic levels (fish). This highlighted the importance of considering ecosystem efficiency and the limitation of models which include growth and consumption, but exclude consideration of reproductive success.

Dr. Jilong Wang and co-authors reported very interesting results demonstrating that different climate change factors can have very different impacts on components of the marine ecosystem. Changes in monsoon, typhoons and SST were shown to have negative impacts on pelagic species, but positive impacts on benthic populations.

Dr. Hiroaki Saito and co-authors presented very interesting data on the economic impacts on the loss of the sardine stock. They reviewed the mismatch between phytoplankton/zooplankton and the arrival of sardine larvae as the cause of the decline and raised the possibility of predicting the success/failure of sardine growth and recruitment. They went on to explore the efficacy of different management strategies to minimize the economic disruption resulting from large fluctuations in abundance of this stock.

Dr. Staci Simonovich showed that long range transport of persistent organic pollutants (POPs) and polycyclic aromatic hydrocarbons (PAHs) from Asia and across the North Pacific and highlighted the importance of understanding the processes at work in the source region.

Dr. Catharina Phillipart and co-authors described an integrated monitoring and data management/distribution network in the Wadden Sea, which is a coastal UNESCO World Heritage site. They pointed out the importance in engaging stakeholders in the design of the network so that objectives of these stakeholders can be met.

Dr. Reiji Masuda presented a very interesting study of the impacts of water temperature and the Great East Japan Earthquake, revealed through visual surveys of fish populations in the subtidal zone at high temporal and spatial resolution. The Great East Japan Earthquake provided an opportunity to document recovery after dramatic changes (tsunami wave impacts on the benthic environment and shutdown of discharge of warm water from nuclear power plants).

Dr. Xuelei Zhang and collaborators reported on the onset and development of a “green tide” of *Enteromorpha* in the Yellow Sea observed since 2007. The authors provided evidence that expanded *Porphyra* cultures are a source for the floating filamentous algae. They also suggested that the floating *Enteromorpha* mats may have outcompeted other harmful algal bloom (HAB) species, resulting in a reduction of some common HABs that are common in this region.

Dr. Takeo Kurihara and collaborators reported on surveys of mollusk assemblages before and after the earthquake and tsunami. Given the remarkable physical changes (including subsidence of up to 2 metres), the observed impacts on density, richness and composition was surprisingly modest.

Some overall comments:

- Importance of good background or “before” data to evaluate impacts and recovery. Contrast the quite good long term data on radionuclides in ocean waters with the lack of background data to assess the recovery from the *Exxon Valdez* oil spill in Prince William Sound.
- Notwithstanding the comment above, evidence was presented that ecosystems may not always “recover” to their original state.
- While there were several presentations that demonstrate quite rapid recovery of ecosystems to dramatic changes, this was not the case in all circumstances.
- The linkage between activities on land and impact on marine ecosystems was highlighted in several presentations.
- We are seeing an increasing amount of integration of biophysical aspects of ecosystems and socio-economic impacts in PICES presentations. This is a good sign for the FUTURE program

List of Papers

Oral presentations

Tokio Wada (Keynote)

Resilience and sustainability of the human-ocean coupled system – Beyond the Great East Japan Earthquake

Hans W. Paerl, Kedong Yin, James E. Cloern, Paul J. Harrison, Jacob Carstensen and Todd D. O’Brien (Invited)

Global patterns of phytoplankton dynamics in coastal ecosystems: Utilizing long-term data to distinguish human from climatic drivers of ecological change

Benjamin S. Halpern (Invited)

The Ocean Health Index: Global assessment and future priorities

William K.W. Li and Nancy Shackell (Invited)

Ecosystem change in the North Atlantic: Impacts, vulnerabilities, and opportunities

R. Ian Perry and Diane Masson (Invited)

Understanding ecosystem structure, function, and change in the Strait of Georgia, Canada: A human-dominated marine ecosystem

Kitack Lee, Tae-Wook Kim, Raymond G. Najjar, Hee-Dong Jeong and Hae Jin Jeong (Invited)

The anthropogenic impacts on ocean nutrients and carbon systems in the marginal seas of northwestern Pacific Ocean

Anne Hollowed

Projecting future status and trends of commercial fish and fisheries under shifting management strategies and climate change

Yury I. Zuenko

Ecosystem reconstruction of the Japan/East Sea under recent climate change: Lowered productivity vs enhanced efficiency

Jilong Wang, Jilong Li and Wenbo Yang

Impact of major climatic factors on biomass of the main commercial fishes in east China seas

Reiji Masuda (Invited)

Underwater visual census as a tool to monitor coastal ecosystems: Seasonal and interannual fluctuations, effect of thermal discharge from power stations, and recovery from the tsunami disaster

Xuelei Zhang, S.L. Fan, Y. Li, S. Fang, M.Z. Fu, W. Zheng, R.X. Li, Z.L. Wang and M.Y. Zhu (Invited)

The onset and development of green algal tide in the Yellow Sea

Hiroaki Saito, Takaomi Kaneko and Mitsutaku Makino (Invited)

Marine ecosystem responses to sporadic perturbation: Their processes, social impact and possible solutions

Staci Massey Simonich

Is trans-Pacific atmospheric transport and deposition of persistent organic pollutants (POPs) to the North Pacific Ocean significant?

Catharina J.M. Philippart, Martin J. Baptist, Taco de Bruin, Bruno J. Ens, Lucien Hanssen, Folkert de Jong and Frans J. Sijtsma

Sensing marine life and livelihoods at the seashore – An integrated monitoring network and data portal for the Wadden Sea, a coastal UNESCO World Heritage site

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Takeo Kurihara, Kengo Suzuki, Gyo Itani, Masatsugu Iseda, Tomoyuki Nakano, Satomi Kamimura Koji Seike, Takenori Sasaki, Hideki Takami and Susumu Chiba

Comparison of the mollusk assemblage in Japan before vs. after the Great Tohoku Earthquake

Poster presentations

Victor F. Bugaev

Effects of pink salmon (*Oncorhynchus gorbuscha*) stock abundance on the growth of sockeye salmon (*Oncorhynchus nerka*) from Kamchatka River in the ocean

Sangjin Lee

NOWPAP Medium-term strategy to address marine and coastal environment issues in the Northwest Pacific Ocean

Yulia S. Chernyshova and Tatyana Shpakova

Size-age structure of Japanese scallop (*Mizuhopecten yessoensis*) from Alexandrovsky Bay, Japan Sea in 2009–2011

Anna S. Vazhova, Denis P. Kiku, Andrey P. Chernyaev and Lidiya T. Kovekovdova

Assessment of petroleum hydrocarbons and heavy metals in estuarine areas of the rivers of Peter the Great Bay (Japan/East Sea)

Lidiya T. Kovekovdova and Denis P. Kiku

Metals in bottom sediments of Peter the Great Bay (Japan/Est Sea)

Anatoliy L. Drozdov, Galina V. Moyseychenko, Konstantin A. Drozdov and Tatyana S. Vshivkova

Bioassessment of ecological conditions of rivers, estuaries and marine areas around Vladivostok-city: Amurskiy and Ussuriiskiye Gulfs of the Sea of Japan

Vladimir M. Shulkin, Tatyana Yu. Orlova, O.G. Shevchenko and Inna V. Stonik

River runoff as a reason for the seasonal and interannual variability of coastal phytoplankton blooms and hydrochemical characteristics in the northwestern part of the East/Japan Sea

Kuninao Tada, Miho Kayama, Naoto Hirade, Hitomi Yamaguchi, Supaporn Yamaguchi, Kazuhiro Harada, Minoru Tada, Munehiro Fujiwara, Kazuhiko Ichimi and Tsuneo Honjo

Decrease of surface water nutrient concentration and nutrient flux from the sediment in Harima-Nada, Eastern Seto Inland Sea, Japan

Alla A. Ogorodnikova

A system of biotic indices and impact – Response indicators of hydraulic activity on marine bioresources

Dmitry Galanin, Sergey Dubrovsky, Viktor Sergeenko, Tatyana Shpakova and Yulia S. Chernyshova

Current state of the scallop *Mizuhopecten yessoensis* (Jay, 1856) resources of the Sakhalin-Kuril region (Okhotsk Sea)

Hyeong Kyu Kwon, Han-Soeb Yang, Seok Jin Oh, Ju Chan Kang and Chang Geun Choi

Phytoremediation: Novel approach to remediate eutrophic coastal sediment using light-emitting diodes (LEDs) and benthic microalgae (BMA)

Machiko Yamada, Mayuko Otsubo, Yuki Tsutsumi, Chiaki Mizota, Kuninao Tada and Paul J. Harrison

Effect of fresh water on species diversity of the genus *Skeletonema* (Bacillariophyceae) in coastal and brackish waters

Marisol Garcia-Reyes and William J. Sydeman

Wavelet decomposition of upwelling: Forcing and ecosystem response

Larissa A. Gayko

Influence of climate change on the development of mollusks on marine farms (Possyet Bay, Japan/East Sea)

Anna S. Vazhova and Andrey P. Chernyaev

Content of polycyclic aromatic hydrocarbons (PAHs) in sediments of Amur Bay (Peter the Great Bay, Japan/East Sea)

Talgat R. Kilmatov

Changes in natural environment capacities due to climatic trends and possible migration of manpower on the western shore of the North Pacific

Tamara G. Ponomareva and Polina A. Sokolova

The Amur River estuary system

Min-bo Luo and Yun-long Wang

Community macrobenthos response to engineering in Hangzhou Bay, China

MEQ Topic Session (S2)***Range extension, toxicity and phylogeny of epiphytic dinoflagellates***

Co-convenors: *William Cochlan (USA) and Satoshi Nagai (Japan)*

Background

Ciguatera fish poisoning is a growing food-borne illness that is common in tropical waters, where poisoning numbers are poorly known but estimated to range from 50,000 to 500,000 cases per year. The incidence of ciguatera is on the rise, and appears to correspond to disturbances in the environment such as nutrients released into coastal waters, land-use changes, or warmer coastal waters. Indeed, the flagellates, *Gambierdiscus* and *Ostreopsis*, that can produce ciguatoxin- or palytoxin-like compounds, appear to be spreading to more temperate latitudes, including the waters of PICES member countries. To gain better insight to this new issue, papers addressing benthic dinoflagellate taxonomy, evidence for range extension, descriptions of standardized sampling programs; assays for assessing toxicity, and sentinel products to alert public health officials to ciguatera risk were invited. The goal of the session was to formulate a better understanding of environmental conditions fostering the prevalence of ciguatoxin-producing organisms in new geographical regions.

Summary of presentations

The primary goal of the session was to provide PICES scientists with a better understanding of Ciguatera Fish Poisoning (CFP), specifically the taxonomy, distribution, range extension, toxicity and phylogeny of the epiphytic dinoflagellates (*i.e.*, *Gambierdiscus* and *Ostreopsis*) responsible for CFP as well as the methodologies and developments in the detection of their potent biotoxins (*i.e.*, ciguatoxin and palytoxin analogues). As part of the session's overall goal, it was crucial to evaluate the environmental conditions associated with the prevalence and enhancement of ciguatoxin-producing organisms in new geographical regions, and to understand the procedures and approaches to evaluate both the health risks and the mechanisms to alert public health officials (and the public itself) of these harmful algal bloom events in past and newly impacted regions of the Pacific Ocean.

The scheduled session consisted of seven oral presentations and one poster, representing authorship from five PICES member countries: Canada, Japan, Korea, Russia, and the United States, and one non-PICES country: The Cook Islands. There was one last minute cancellation (Dr. Patricia Tester, USA – originally an invited speaker) and one replacement (Dr. Toshiyuki Suzuki, Japan) who graciously agreed to present his group's research results despite only a short time to prepare. Attendance at the session was good, there were many questions and discussions; the audience consistently exceeded 25–30 people throughout the half-day session.

After brief introductory remarks by one of the convenors, Dr. Satoshi Nagai, the first invited (replacement) speaker, Dr. Toshiyuki Suzuki, discussed his research group's successful attempts to detect and characterize palytoxin-like compounds in *Ostreopsis* strains isolated from Japan, and confirmed their production of an analogue of palytoxin (novel ovatoxin isomers). He demonstrated that the toxin content of some strains collected in Japan were comparable to those obtained from the Italian coast, and also noted that *Ostreopsis* isolates collected from the same area at the same time off Japan (and cultured under identical conditions) may or may not be toxic to humans.

The second invited speaker, Dr. Masao Adachi (Japan), demonstrated that non-toxic *Gambierdiscus* species were generally restricted to temperate regions (adapting to temperate conditions) whereas toxic species were mainly distributed in sub-tropical regions (adapting tropical conditions). He examined the growth response of these two typical isolates on different WT-SAL conditions, and speculated that the dominant species in Japanese waters may change from non-toxic to toxic species due to increased sea temperature as a consequence of global climatic warming. A third Japanese speaker, Dr. Takuo Omura, summarized the occurrences of CFP in Japan, and showed that there are several ecotypes evidenced by the different temperature and salinity tolerances exhibited in *Gambierdiscus toxicus*. The fourth speaker, Professor Charles

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Trick (Canada), reviewed CFP from the point of view of a scientist's role in public health and safety, and described emerging methodological perspectives using examples from both HAB and other ecosystem health monitoring programs. He stressed the importance of reducing the frequency of toxic impacts to the public by the implementation of toxin surveillance – algal-based, coastal forensics programs (*i.e.*, “plankton watch followed by toxin watch”), and urged PICES scientists to ensure that community goals and scientific goals match, and to remember that a healthy environment leads to healthy people. Our third invited (and fifth speaker overall), Dr. Teina Rongo (Cook Islands and a recent graduate of the Florida Institute of Technology, USA), reported on the frequency and magnitude of CFP in the Cook Islands where currently approximately 10% of the population is impacted each year by CFP, and discussed the linkages between CFP and climate, and the resultant impacts on the population migration patterns of Pacific Islanders in the past. He demonstrated a clear scenario that led to a high risk of CFP due to the positive Pacific decadal oscillations by El Niño whereby the high frequency of physical disturbance events provide increased benthic space on reefs for macro-algal growth which are the preferred habitat for these benthic dinoflagellates, resulting in frequent occurrences of CFP in the Cook Islands. Based on his personal experiences, Dr. Rongo, who has been the victim of CFP on several occasions, reported that other substances (*e.g.*, peanuts) appear to elicit the same clinical responses as CFP.

The sixth speaker, Dr. Tatyana Yu. Orlova (Russia), outlined the abundance, distribution and fluctuation of benthic dinoflagellates of *Ostreopsis* spp. in the Russian coastal waters of the Sea of Japan during the period 2008 to 2011. She showed that thirteen species of *Ostreopsis* are permanent and predominant components of epiphytic assemblages in “slightly shaken” sites in Peter the Great Bay, and emphasized the importance of hydrodynamic conditions in controlling the distribution of *Ostreopsis* spp. in her study area. The seventh and final speaker was Dr. Changkyu Lee (Korea) who outlined the geographic distribution of benthic dinoflagellates of *Gambierdiscus* spp., *Ostreopsis* spp., *Coolia monotis* and *Prorocentrum lima* along the southern coast of Korea including Jeju island during June to September of 2011 and 2012, and noted that *Ostreopsis* sp. was the most dominant benthic dinoflagellate. Following the final presentation and a lively period of discussion among speakers and attendees, Dr. William Cochlan (USA) provided closing remarks for the session.

In summary, scientists have made considerable progress from PICES member countries, describing the geographical distribution and spread of the organisms responsible for CFP, but there are still very limited data on the toxicity of most of these epiphytic dinoflagellates. The toxin chemistry is still under investigation, resulting in the difficulty of the risk evaluation of fish poisoning in PICES and non-PICES countries. Although successful culturing attempts have been conducted elsewhere, it is clear that controlled culturing studies of toxic isolates of *Gambierdiscus* are needed to better evaluate not only the toxicology of ciguatoxin, but also for the characterization of related toxins. With such efforts, the scientific community can then establish a supply of standard products and operating procedures for the study of these toxic dinoflagellates, and elucidate the environmental conditions for their growth and determine the environmental and/or physiological triggers for their production of these potent biotoxins.

List of papers

Oral presentations

Toshiyuki Suzuki, Ryuichi Watanabe, Hajime Uchida, Ryoji Matsushima, Hiroshi Nagai, Takeshi Yasumoto, Takamichi Yoshimatsu, Shinya Sato and Masao Adachi (Invited - replacement)

Discovery of novel ovatoxin isomers in several *Ostreopsis* strains in Japan

Masao Adachi, Takamichi Yoshimatsu, Haruka Iwamoto, Tomohiro Nishimura and Haruo Yamaguchi (Invited)

Effect of temperature change on the dominant species of *Gambierdiscus* in Japan - From a non-toxic species to a toxic species?

Takuo Omura and Yasuwo Fukuyo

Gambierdiscus in the mainland of Japan

Charles G. Trick and Danielle Beausoleil

HABs and Ciguatera Fish Poisoning: Emerging methodological perspectives

Teina Rongo and Robert van Woesik (Invited)

Ciguatera poisoning and climate oscillations in Rarotonga, southern Cook Islands

Marina S. Selina, Tatiana V. Morozova, Nellya G. Litvinova and Tatyana Yu. Orlova

Toxic epiphytic dinoflagellates in Peter the Great Bay, Sea of Japan, Russia

Changkyu Lee, Taegy Park and Youngtae Park

Geographic distribution of benthic dinoflagellates along Korean coasts

Poster presentations

Seung Ho Baek

Occurrence of epiphytic dinoflagellate *Gambierdiscus* spp. in the uninhabited Baekdo Islands and Seopsoom Island in the vicinity of Seogwipo, Jeju Province, Korea

POC Topic Session (S3)

Challenges in understanding Northern Hemisphere ocean climate variability and change

Co-sponsored by: *CLIVAR and ICES*

Co-convenors: *Jürgen Alheit (ICES/Germany), Emanuele Di Lorenzo (PICES/USA), Michael Foreman (PICES/Canada), Shoshiro Minobe (PICES/Japan), Hiroaki Saito (PICES/Japan) and Toshio Suga (CLIVAR/Japan)*

Background

Physical climate variability and change exert substantial impacts on marine ecosystems, particularly on longer timescales because of the longer ocean memory compared with the atmosphere, and the cumulative effects on marine ecosystems. On a centennial scale, climate changes due to anthropogenic forcings may dominate over natural variability, but variations on decadal or shorter timescales may be mainly due to natural climate variability. Furthermore, natural climate variability can be modified via climate changes. Therefore, a correct understanding of the mechanisms underlying climate variability and change should be the basis for understanding and predicting future conditions of the North Pacific and North Atlantic. For the North Pacific there is no widely accepted consensus on the mechanisms governing decadal-to-multidecadal climate variability, and this mainly reflects the uncertainty of how, or even whether, the mid-latitude ocean influences the atmosphere. Some linkages between processes, such as oceanic memory due to Rossby wave propagation, are generally accepted, and predictability associated with these processes may also be important for understanding marine ecosystem impacts. It is also unclear if teleconnection dynamics between the North Pacific, North Atlantic and the Arctic exert an important control on the ocean's decadal climate state. This session brings together researchers of marine ecosystems, physical oceanography and climate to share ideas about what physical parameters and processes are important in understanding and predicting the response of specific marine ecosystems to climate forcing. Through collaboration among PICES, CLIVAR and ICES, this session invited contributions exploring important developments in the research field of the North Pacific climate variability and change, including physical environmental variations and their predictability, teleconnection dynamics between oceanic basins, such as the Pacific and Atlantic Oceans, and linkages between physical conditions and marine ecosystems.

Summary of presentations

This session was extremely well attended (>150 scientists) and brought together a rich diversity of scientists ranging from physical oceanographers and climate dynamicists to marine ecosystem scientists. The main goal of this session was to identify the challenges in understanding the physical parameters and processes that are important in diagnosing and predicting the response of specific marine ecosystems to climate forcing. The session was characterized by a set of high profile talks (both invited and regular) that provided a well balanced view of (a) new advances in understanding the climate dynamics of the North Pacific and Atlantic oceans, (b) the observed links between climate and ecosystem variability, and (c) mechanisms that may be important to include when developing climate-driven process models to hindcast and forecast changes in the marine ecosystem.

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The session opened with an introductory invited talk by Dr. Kenneth Drinkwater who provided examples of how the changes we observe in the marine ecology are not simply a response to climate but also are influenced by human-induced factors, such as fishing, pollution, ocean acidification, land development, as well as non-climate forced species interactions and diseases. Responses of the marine environment result from a combination of all of these factors, which often interact non-linearly. Nevertheless, the links between long-term changes in marine ecosystems and modes of climate variability are strong and clear. Dr. Jürgen Alheit and Dr. Nathan Mantua (invited) reinforced this point by providing a comprehensive and updated overview of documented long-term changes in a variety of fish stocks in relation to different climate modes over the North Atlantic and North Pacific sectors. These strong links between the climate modes and the ecosystem data archives raised questions about whether it is possible to develop low-order ecosystem process-based models to diagnose and forecast the ecosystem response to climate forcing. Dr. Patrick Cummins and later, Dr. Curtis Deutsch (in session S14), showed how climate-driven process models are indeed capable of explaining important biogeochemical quantities such as dissolved oxygen in the tropical and northeast Pacific. Dr. William Peterson's and Dr. Jennifer Fisher's talks went further and provided specific guidelines and examples for developing simple ecosystem process models for zooplankton variability in the Oregon Shelf in relation to changes in ocean advection, upwelling and temperature forced by the Pacific Decadal Oscillation (PDO). On the other hand, while the prospect of developing these simple process models is exciting, Dr. Akinori Takasuka (invited) introduced caution in using this approach, especially when moving further up the trophic levels to small pelagic fish. Even if the links between fish stock variability and the climate modes are often statistically strong, he presented evidence of how the interaction of climate with small pelagics is not always direct but mediated through changes in a large range of vital parameters to which the small pelagics are sensitive. He also showed that this sensitivity is species dependent and therefore, isolating the species-specific responses to environmental factors is a critical step towards understanding and modeling the dominant biological processes and the consequences of climate variability and change.

Another important consideration on developing models to forecast ecosystem changes was pointed out by Dr. Mantua and is related to how predictable are the oceanic responses (*e.g.*, the climate modes) to atmospheric forcing. Process models often used for explaining large-scale climate modes like the PDO and the North Pacific Gyre Oscillation (NPGO) is an auto-regressive model of order 1 (AR1, red noise process) forced by random white noise atmospheric variability. The AR1 model dynamics implies that there is little predictability beyond the monthly to seasonal timescale because the future state only depends on the preceding state with some auto-decorrelation timescale. Although some other hypotheses were proposed including climate oscillations arising from delay negative feedback from the ocean to the atmosphere and periodic oscillations of extraterrestrial origins, there is not enough evidence that these mechanisms play essential roles in shaping North Pacific climate to an extent that one can expect practical predictability. On the other hand, delayed ocean responses that follow the excitation of these climate modes or follow from other direct atmospheric forcing are predictable and may be used as forcing functions to forecast ecosystem responses. This is the case especially in the western boundary systems.

The talks on western boundary dynamics took place in the afternoon session and presented very exciting new advances in the physical mechanism that control the ocean low-frequency response to external atmospheric forcing. Dr. Young-Oh Kwon (invited) opened the session with a comprehensive review of the conceptual models of decadal climate and ecosystem variability in the Kuroshio-Oyashio Extensions and Gulf Stream. He showed that there are important similarities in the delayed (and predictable) oceanic response of the Pacific and Atlantic western boundary currents to the climate modes (up to 6-year lag), and also provided evidence that these physical changes lead to predictable responses in selected marine ecosystem populations. For example, two populations of silver hake (*Merluccius bilinearis*) in the Northeast U.S. Shelf show significant changes in their spatial distribution that are correlated with the north-south shift in the Gulf Stream ($r = 0.71$). These changes in hake lag the changes in the Gulf Stream suggesting that it is possible to develop multi-year ecosystem forecasts. Following the opening talks were two hard-core physical oceanography talks that explained in more depth the mechanisms controlling the delayed oceanic responses of the western boundary current systems. Dr. Yoshi Sasaki (invited talk who received a Best Presentation PICES award for a POC-sponsored session; see Best Presentations list at the end of Session Summaries) presented a new theory (thin-

jet theory) that explains how ocean decadal anomalies of the PDO and NPGO forced in the central and eastern North Pacific propagate as Rossby waves into the western boundary and transfer their energy into the eddy-scale circulations of the Kuroshio jet. This theory not only explains previous observations showing how the Kuroshio decadal variability has a lagged response to the climate modes but also begins to address the issue of how eddy-scale circulation, which is presumably important to ecosystem processes, responds to climate forcing. This issue was later addressed by Dr. Andrew Davis who showed that atmospheric climate variability could lead to deterministic responses in the eddy-scale circulations also in the North Pacific eastern boundary (e.g., the California Current). To complement Dr. Sasaki's results, Dr. Bunmei Taguchi presented modeling evidence suggesting that the decadal modulations of the Kuroshio (e.g., the delayed response to PDO and NPGO) can have an additional delayed feedback on the central and eastern North Pacific via a subsurface oceanic pathway that involves the advection of thermocline heat anomalies by the North Pacific gyre from the western boundary to the central and then eastern North Pacific. This sequence of cause and effect that originates from the atmospheric forcing can lead to predictable oceanic responses on timescales of decades and, in turn, provide the basis for forecasting ecosystem changes. Although the idea of exploiting the delayed oceanic responses for predictability purposes has been around for a while, especially in the western boundary, the additional understanding of how these delayed effects impact eddy-scale circulations and transport dynamics may link the climate forcing to ecosystem processes and their prediction. In fact this issue was the main focus of the last talk of the session by Dr. Toshio Suga, who introduced Western North Pacific Integrated Physical-Biogeochemical Ocean Observation Experiment (INBOX). Dr. Suga reinforced the premise that eddy-scale dynamics (e.g., mesoscale and submesoscale processes) play a critical role in linking physical conditions to marine ecosystem dynamics through intense convergence/divergence, upwelling/downwelling and mixing. In fact, this was the motivation behind the launch of INBOX in 2010 by JAMSTEC. The goal of INBOX is to acquire physical-biogeochemical observational data necessary to resolve mesoscale and submesoscale physical-biological phenomena.

List of papers

Oral presentations

Kenneth F. Drinkwater (Invited)

Challenges in understanding ocean climate variability and change and its impacts: Temporal and spatial scales and multi-forcings

Jürgen Alheit

Impact of multi-decadal climate forcing on northern hemisphere small pelagic fish populations

Andrey S. Krovinin, Boris N. Kotenev and George Moury

Interaction of major teleconnection patterns as a mechanism linking the North Pacific and North Atlantic climate

Nathan Mantua and Megan Stachura (Invited)

Empirical evidence for North Pacific ecosystem regime shifts revisited

William T. Peterson, Jay Peterson, Cheryl A. Morgan and Jennifer L. Fisher

Tracking ecosystem change in the northern California Current

Akinori Takasuka, Ichiro Aoki and Yoshioki Oozeki (Invited)

Environmental windows for small pelagic fish in the western North Pacific: How do their vital parameters respond to climate variability and change?

Albert J. Hermann, Nicholas A. Bond, Georgina A. Gibson, Enrique N. Curchitser, Kate Hedstrom and Phyllis J. Stabeno

Biophysical frequency response of the Bering Sea to large-scale forcing

Hyung Jeek Kim, Kiseong Hyeong, Chan Min Yoo, Dongseon Kim and Boo-Keun Khim

Impact of strong El Niño events on sinking particle fluxes in the 10°N thermocline ridge area of the northeastern equatorial Pacific

Elena I. Ustinova and Yury D. Sorokin

Regional features of the climate variability and change in the Far-Eastern Seas

Young-Oh Kwon (Invited)

Role of the Kuroshio-Oyashio Extensions and Gulf Stream in the decadal climate and eco-system variability

Bunmei Taguchi and Niklas Schneider

Dynamics of North Pacific oceanic heat content variability on decadal time-scale

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Yoshi N. Sasaki, Shoshiro Minobe and Niklas Schneider (Invited)

Interannual to decadal variability of the Gulf Stream and Kuroshio Extension jets

Jennifer L. Fisher, William T. Peterson, Cheryl A. Morgan and Jay Peterson

Basin-scale *versus* local-scale drivers of copepod community dynamics in the northeast Pacific (Newport, Oregon, USA)

Andrew Davis and Emanuele Di Lorenzo

Forcing dynamics of mesoscale eddies in the California Current

Vadim Navrotsky

Effects of solar activity on climate-ocean ecosystems interactions

Howard J. Freeland

Temperature, salinity and density trends along Line-P and the implications for mixed layer formation

Patrick Cummins and Diane Masson

Wind-driven variability of dissolved oxygen below the mixed layer at Station P

Haruka Nishikawa, Yoichi Ishikawa, Masafumi Kamachi, Hiromichi Igarashi, Shuhei Masuda, Toshimasa Doi, Shiro

Nishikawa, Yoshihisa Hiyoshi, Yuji Sasaki, Takashi Mochizuki, Hiroshi Ishizaki, Tsuyoshi Wakamatsu and Toshiyuki Awaji

Estimation of nutrient supply process in the spring Kuroshio-Oyashio transition region

Toshio Suga, Shigeki Hosoda, Ryuichiro Inoue, Kanako Sato, Koketsu Shinya, Taiyo Kobayashi, Fumiaki Kobashi,

Katsuya Toyama, Toshiyuki Kita, Makio C. Honda, Kazuhiko Matsumoto, Kosei Sasaoka, Tetsuichi Fujiki, Hajime

Kawakami, Masahide Wakita, Yoshikazu Sasai, Akihiko Murata, Kazuhiko Hayashi, Yoshimi Kawai, Vincent Faure,

Akira Nagano, Takeshi Kawano and Toshiro Saino

Western North Pacific Integrated Physical-Biogeochemical Ocean Observation Experiment (INBOX)

Poster presentations

Svetlana Yu. Glebova

Winter cyclonic activities over the ocean as a factor in the subsequent changes in the atmospheric and thermal regime of the Far Eastern Seas and north-west Pacific (with a shift in one year)

Qinghua Qi, Rong-shuo Cai and Qilong Zhang

The variability of sea temperature in South China Sea (SCS) and its relationship with the early or later of SCS summer monsoon outbreaks

Howard J. Freeland

The current status of the international Argo project

Hong-jian Tan and Rong-shuo Cai

Possible impact of El Niño Modoki on marine environment in China offshore and its adjacent seas

Taewook Park, Chan Joo Jang, Minho Kwon, Hanna Na and Kwang-Yul Kim

ENSO effect on surface salinity variability in the Yellow and East China Seas in summer

Dmitry V. Stepanov, Victoria I. Stepanova and Nikolay A. Diansky

Interannual to interdecadal variability of circulation in the Japan/East Sea based on numerical simulations

Larissa A. Gavko

Air-sea interaction along the coast of north-western East/Japan Sea within 75 years

Yang Liu, Sei-Ichi Saitoh, I. Nyoman Radiarta, Tomonori Isada, Toru Hirawake, Hiroyuki Mizuta and Hajime Yasui

Impact of climate variability on marine aquaculture: A case study on the Japanese kelp in southern Hokkaido, Japan, using satellite remote sensing and GIS-based models

Yuri Oh, Chan Joo Jang and Jihyun Lee

Enhanced stratification in the southwestern East Sea (Japan Sea)

Yoshikazu Fukuda, Wataru Ito, Toshiya Nakano, Shiro Ishizaki and Tsurane Kuragano

Decadal variability of subsurface temperature in the North Pacific and recent modulation of the leading EOF modes

Larisa Chernysheva and Viktoria Platonova

Seasonal climate variability on the coastal zone of the western part of North Pacific

Kosei Komatsu

3D structure and decadal change of the nutrient in the Kuroshio region detected from historical data

Naoki Furuichi, Toshiyuki Hibiya and Yoshihiro Niwa

Assessment of turbulence closure models for resonant inertial response in the oceanic mixed layer using a large eddy simulation model

Olga Skaberda, Lubov' Vasilevskaya and Julia Stochkute

The relationship between the air temperature of East Kamchatka and the water temperature of western part of the Bering Sea

Yulong Liu, Qi Wang and Jinkun Yang

The features of bifurcate line about the North Equatorial Current in the Pacific

Chan Joo Jang, Jihyeon So, Taewook Park and Sinjae Yoo

Mixed layer variability and its associated chlorophyll *a* changes in the East Sea (Japan Sea)

FIS/MONITOR/POC Topic Session (S4)

Monitoring on a small budget: Cooperative research and the use of commercial and recreational vessels as sampling platforms for biological and oceanographic monitoring

Co-convenors: *Steven Barbeaux (USA), Jennifer Boldt (Canada), Martin Dorn (USA) and Jae Bong Lee (Korea)*

Background

Long-term monitoring is a key component of an ecosystem-based approach to fisheries management. Time series data enable the examination of changes in oceanographic and community metrics. Government funding sources for long-term monitoring of biological and oceanographic processes has dwindled in recent years, while the mandate for this type of information has increased. If data driven ecosystem-based management continues to be goal then methods for reducing the costs of data collection must be found while data quality is maintained. An example of this type of innovative approach can be found in Alaska walleye pollock (*Theragra chalcogramma*) fishery where researchers have teamed with commercial fishers to deploy inexpensive temperature and depth data storage tags on trawl nets. At the same time, data on fish density and distribution are being collected using the fishing vessels' own acoustic systems. These data are being used to validate oceanographic models, to assess the effects of oceanographic conditions on bycatch in the walleye pollock fishery, and to evaluate the effects of oceanographic conditions on walleye pollock density and distribution. This session was intended to explore the ways in which cooperative research with other seagoing stakeholders and the use of commercial and recreational vessels as sampling platforms for biological and oceanographic monitoring can be integrated into ocean monitoring systems.

Summary of presentations

Although cooperative monitoring has long been part of our scientific tool box, Topic Session 4 at the 2013 PICES annual meeting is the first time ICES or PICES has offered a session aimed specifically at highlighting cooperative monitoring projects. Shrinking governmental budgets are making it difficult to develop or expand ocean monitoring systems. Cooperative monitoring provides a means to leverage scarce government funding and has the added benefit of involving other stakeholders in the scientific process. Working together with fishers and other stakeholders in cooperative projects allows scientists not only to collect data cost effectively, but also to collect data over temporal and spatial ranges and at times of the year that would not be feasible using research vessels or fixed moorings. In this session there were ten papers presented and two posters displayed covering a diverse array of cooperative projects from around the Pacific. The projects ranged from opportunistic data collections where data are collected while vessels and crew go about their everyday activities, to directed cooperative survey efforts where vessels and crew are contracted or volunteer to collect data in systematic manner.

The session began with invited speaker, Dr. Rudy Kloser, the team leader of the Marine Environmental Prediction Program at CSIRO Marine Research Center in Hobart, Tasmania, Australia. His research includes projects that are a part of an integrated marine observing system. Dr. Kloser presented his research that uses cost-effective acoustic technology on commercial vessels to monitor deep-water and remote fisheries and basin-scale ecosystems off Australia using fishing vessels. This has been facilitated in Australia with the overall governance of the fisheries where there are clear incentives for engaging in monitoring. More broadly, this incentive is also driven by societal drivers for sustainable fisheries. To meet these challenges new

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technologies and methods have been developed in Australia to ensure data quality is maintained. At the larger ocean basin scale, he showed how fishing vessels provided data useful for developing valuable insights into the structure and function of pelagic ecosystems. This bio-acoustic sampling method has been integrated into an ocean observing system looking at decadal trends in environmental variability. He further demonstrated how complementary depth stratified net tows and fine-scale acoustic and optical sampling were helping to provide some of the necessary biological interpretations. Future research for CSIRO is focused on how best to use the data for ecological indicators or input into ecological models.

The next presenter was Dr. Sonia Batten from the Sir Alister Harder Foundation for Ocean Science. She presented information on ships-of-opportunity sampling of lower trophic levels. In her presentation she stated that Continuous Plankton Recorders (CPRs) have been towed behind commercial ships and other vessels of opportunity generating spatially and temporally referenced quantitative data on the abundance and distribution of many zooplankton and larger phytoplankton taxa. Benefits (*e.g.*, highly cost-effective sampling of large remote oceanic regions), were discussed as well as limitations of this approach (*e.g.*, lack of control over exactly when and where sampling occurs). In more recent years, she stated that the CPR has itself become a sampling platform with instrumentation added to the towed body which autonomously collects physical data (T, S, D) and chlorophyll fluorescence, or microplankton via a self-contained water sampler. She believed that there is the potential to develop large-scale, multi-trophic level monitoring programs with some supplemental physical data.

Dr. Elizabeth Logerwell from the Alaska Fisheries Science Center, Seattle, Washington, presented a study that used walleye pollock acoustic survey data and Steller sea lion abundance and foraging information to manage fisheries interactions with Steller sea lions in the Aleutian Islands, Alaska. The study employed aerial surveys for sea lion abundance, scat sampling from a contracted survey vessel, and acoustic surveys of prey fields from both a commercial fishing vessel and a research vessel. In this study the biomass of pollock potentially available for sea lions and the fishery was quantified, areas of high pollock biomass were identified, and areas where pollock were likely to be important to sea lions were identified. The diet composition of sea lions was related to pollock abundance, but the distribution of sea lions among haul-out sites was not. Instead, the distribution of sea lions appeared to be driven by the distribution of Atka mackerel (*Pleurogrammus monopterygius*), their most common prey year round. Dr. Logerwell suggested that in the Aleutian Islands, sea lion diets respond to small-scale, short-term distribution of prey (pollock) whereas their spatial distribution during the non-breeding season among haul-out sites may primarily reflect the larger annual-scale distribution of Atka mackerel.

Dr. Elena Ustinova from the Pacific Fisheries Research Centre (TINRO-Centre) in Vladivostok, Russia, presented her research on monitoring oceanographic and biological conditions during the saury fishery (from August to December) in the Northwestern Pacific. Monitoring oceanographic and biological conditions was accomplished using sensors on commercial fishing vessels in combination with other oceanographic and climatological data. She indicated that saury fishing activities were related to oceanic fronts of different scales and the effectiveness of the fishery depends on the ability of forecasting of hydrometeorological conditions. In recent years TINRO has been creating and using new information technologies to providing real-time operational scientific support to the saury fishery, and using collected data to visualize and forecast saury distribution in relation to climate, weather, and oceanographic factors. Sea surface temperature data obtained *in situ* allowed them to improve satellite derived SST estimates for the fishing area and to determine local ocean conditions (areas of the fronts, the individual eddies, *etc.*). The presence of a scientist on board the commercial fishing or processing vessel provided for the collection of biological data (*e.g.*, size-age structure of sampled fish). These data have been added to the long time-series on the biological characteristics of saury. She believed that “saury-related” monitoring could contribute to a larger ocean monitoring system.

Ata Suanda from the College of Earth, Ocean, and Atmosphere at Oregon State University in Corvallis, Oregon, presented long-term observations of internal waves with shore-based video cameras. Internal waves are implicated in the mixing and transport of pollutants and planktonic organisms including juvenile fish; however, the arrival timing and frequency of wave occurrence is poorly understood. In this work, a low-cost

observation technique using shorebased video cameras was presented to provide long-term measurement of internal waves. Using ADCP and thermistor chains with video observations on the central Oregon inner shelf, the surface expression of internal waves, visible as streaks of increased pixel intensity in video imagery, were tracked through time and space and compared to wave propagation speed and direction from *in-situ* measurements. Archived video observations from this location were also analyzed and consideration was given towards extending the technique to the use of non-research, freely available beach webcams.

Oksana G. Mikhailova, Laboratory of the Commercial Invertebrate, Kamchatka Research Institute of Fisheries and Oceanography, presented her study on coastal monitoring of the state of the pink shrimp *Pandalus borealis* population on West Kamchatka using at-sea observers on board commercial fishing vessels. In recent decades, due to budget constraints, pink shrimp population levels on the West Kamchatka coast and the health of the fishery have been monitored by on-board observers. The data they have obtained in the commercial district near the south-west coast of Kamchatka for 2004–2012 became the basis for the stock assessment and abundance forecasts. The total allowable catch for the district was estimated using the on-board observer data during 2005–2011. A stable growth of pink shrimp abundance was shown. Since sampling was carried out using a specialized shrimp trawl, also utilized in commercial fishing, analyses can include a number of commercial parameters, unavailable in scientific survey sampling. A huge biostatistical data pool on distribution, size-weight characteristics and dynamics of egg development of pink shrimp has recently been formed due to the inclusion of these data. Temperature data in the area inhabited by pink shrimp were also collected. The commercial fleet normally operates in spring or autumn, and is helping to track population migrations. Thus, current monitoring of pink shrimp from commercial vessels plays a very important role and can be used in the case of limited finances in the future.

Christopher Siddon, Alaska Department of Fish and Game in Juneau, Alaska, presented an intensive, cost-effective method to improve red king crab stock assessments in southeastern Alaska through collaboration with the commercial fishing industry. A collaborative effort between the Alaska Department of Fish and Game (ADFG) and the commercial fishing industry provides a novel, cost-effective method to improve stock assessment methods and facilitate positive working relationships. Utilizing the strengths of the fishing industry and the ADFG, they designed a joint project to improve the understanding of red king crab distributions and ground-truth current stock assessment methods. Specifically, they compared a Catch Survey Analysis (CSA) model with depletion and mark-recapture estimates for six areas. The depletion model estimate of crab abundance for St. James Bay was 30% lower than the estimate from the CSA model. The mark-recapture estimates of crab abundance averaged 3.6 (± 1.6 SE) times higher than the CSA model estimates. In addition, results from the mark-recapture data suggest large changes in crab behavior (movement and catchability) over relatively short time scales (months).

Dr. John A. Barth, College of Earth, Ocean, and Atmosphere at Oregon State University in Corvallis, Oregon, presented information on environmental sampling, hypoxia and the Northwest Fisheries Science Center's Cooperative U.S. West Coast Groundfish Bottom Trawl Survey. The NOAA NMFS Northwest Fisheries Science Center (NWFS) currently conducts a number of groundfish research and monitoring projects that are cooperative and collaborative with the fishing industry. These include a West Coast Groundfish Bottom Trawl Survey (WCGBTS), a hook and line survey of shelf rockfishes in the Southern California Bight, pelagic trawl surveys of juvenile groundfishes, and acoustical optical pilot surveys of pelagic rockfishes in untrawlable habitats. In the context of such cooperative research programs, advancements in sampling technologies have allowed new types of data to be collected during traditional NMFS surveys. For example, environmental sensing packages were attached to trawls and recorded a full array of environmental parameters (*e.g.*, depth, temperature, salinity, dissolved oxygen, chlorophyll fluorescence, turbidity, and light). These improved environmental sensing capabilities have led to collaborations with academic partners and with the developers and manufacturers of sensing packages. In 2007, the NWFS added an environmental sampling program to the WCGBTS that included collaboration with physical oceanographers at Oregon State University. This program was initiated, in part, in response to hypoxia that was observed on the continental shelf of the Pacific Northwest, in a region not previously characterized by hypoxic conditions. Fishery and environmental sampling is conducted from chartered commercial trawlers from 55 to 1280 m and from the U.S.–Canada

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border to the U.S.–Mexico border. A nested sampling design encompasses the oxygen minimum zone of the California Current as well as a known hypoxic area on the continental shelf off the Oregon coast. Dr. Barth showed some impressive figures on the data collected through these programs and demonstrated the usefulness of this approach. The bottom line is that cooperative monitoring in this case may not be cheap, but was cost-effective.

Dr. Kazuaki Tadokoro, Tohoku National Fisheries Research Institute, Miyagi, Japan, discussed the archive of historical meso-zooplankton samples collected around Japan. Knowledge about the meso-zooplankton community would improve our understanding of the effects of large-scale climate change on marine ecosystems. Meso-zooplankton samples can be preserved in buffered formaldehyde for a long time with low cost. The Fisheries Research Agency of Japan and multiple prefectural fisheries stations/institutes have systematically collected fish eggs and larvae by plankton nets to investigate the spawning of commercially important pelagic fish such as Japanese sardine from the 1970s. More than 6,000 samples were collected in the last fiscal year. A portion of those samples contributed to the Odate Collection, which is a world-famous meso-zooplankton archive. Also, another portion of the samples has been used for studies on the long-term variation of the marine ecosystems analyzed by the bench top Video Plankton Recorder (B-VPR) in the Kuroshio waters. However, the samples have not yet been systematically archived in the center institute. Currently, it is difficult to use the samples for the large-scale studies efficiently. Therefore, archiving the historical collection of samples systematically in the Tohoku National Fisheries Institute has started this year. Moreover, the database of the archival samples is being constructed to utilize them more efficiently.

Because he was unable to attend the conference, Dr. Steven Barbeaux, Alaska Fisheries Science Center, Seattle, Washington, pre-recorded a presentation on cooperative monitoring in the Alaska walleye pollock (*Theragra chalcogramma*) fishery. Researchers in Alaska are implementing cooperative monitoring programs to address the issue of long-term monitoring to help achieve the objective of an ecosystem-based approach to fisheries management. Dr. Barbeaux started with his vision of possible models for ocean monitoring systems and continued with lessons learned in working on cooperative projects in Alaska. He then presented on two projects implemented in Alaska: an opportunistic acoustic data collection project and a project to collect temperature at depth data from commercial trawls. Both projects were very low cost, but resulted in a large amount of high quality data. The opportunistic data were being used to investigate fishery impacts on pollock aggregations across a range of spatial scales in relation to Steller sea lion critical habitat and showed higher exploitation rates inside critical habitat. The temperature at depth data were used to investigate possibilities between temperature and depth and salmon bycatch in the pollock fishery and resulted in concrete advice for fishers to reduce king salmon bycatch. Both projects were successful implementations of cooperative monitoring and are expected to become long-term projects. These projects demonstrated cooperative monitoring programs in which researchers worked with other seagoing stakeholders to inexpensively collect biological and oceanographic data that could be integrated into a long-term ocean observing system.

Dr. Igor Shevchenko, Pacific Fisheries Research Centre (TINRO-Centre) and Far Eastern Federal University in Vladivostok, presented a poster on sharing marine “small science” data. His poster highlighted the fact the major science programs usually specify data format, quality assessment procedures and even ensure open access to collected data through established data centers. Smaller science programs, however, generally do not have these components and the data are unavailable to other scientists. The PICES community has already provided several information services to members and expert groups at the TCODE geospatial portal (<http://67.212.128.197/geonetwork>). Among them is an electronic catalog for publishing metadata. This service is an outcome of the PICES metadata federation project. It allows scientists to prepare, post, edit, and make metadata spatially searchable by particular groups of end users on the Internet. This tool is not currently widely employed and the number of submissions has not grown. PICES urgently needs to implement a data policy and promote a data sharing etiquette. For example, all PICESians should claim their data “officially” by submitting metadata to a searchable catalog, and the metadata and data set references should be cited when a scientific report or a paper is published.

Dr. Orio Yamamura, Hokkaido National Fisheries Research Institute, Kushiro, Hokkaido, presented a poster on walleye pollock. The Doto area is a nursery ground of the Japan Pacific population (JPP) of walleye pollock, one of the most important fishing targets in the Japanese waters. Juvenile pollock settle from late summer through winter into the area, where the predation mortality by demersal fishes is significant. Dr. Yamamura has continued a monthly monitoring of the demersal fish community during the settlement season (April–December) in this area for 10 years, using a small fishing boat (7.3 ton) equipped with a Danish seine. On a typical survey day trip, this boat departs 5:00 in the morning, samples 4 stations by Danish seine, and returns to port by 14:00. It is chartered at <100,000 yen (ca. 1,250 USD) a day.

The fishing gear used had a limitation in catchability of large-sized and benthopelagic gadids (*i.e.*, pollock and Pacific cod) due to the low height of the sampling gear. But it has been useful in monitoring non-commercial predators including Kamchatka flounder (*Atheresthes evermanni*) and plain sculpin (*Myoxocephalus jaok*). The data are used to quantify the predation impact on newly settled age-0 pollock. In this paper, the temporal and bathymetric change in demersal fish community structure was also presented.

List of papers

Oral presentations

Steven J. Barbeaux

Cooperative monitoring in the Alaska walleye pollock (*Theragra chalcogramma*) fishery

Rudy J. Kloser, Tim E. Ryan, Ryan Downie, Mark Lewis and Gordon Keith (Invited)

Using commercial vessels to monitor deep-water fisheries and basin scale ecosystems

Sonia Batten and Anthony Walne

Ship of Opportunity sampling of lower trophic levels

Elizabeth A. Logerwell, Steven J. Barbeaux and Lowell W. Fritz

Using walleye pollock acoustic survey data and Steller sea lion foraging information to manage fisheries – sea lion interactions in the Aleutian Islands

Viktor N. Filatov, Yury.V. Eremin, Elena I. Ustinova and Aleksey V. Ballo

Monitoring of oceanographic and biological conditions in the Pacific saury fisheries expedition

Ata Suanda and John A. Barth

Long-term observations of internal waves with shore-based video cameras

Oksana G. Mikhailova

Coastal monitoring the state of pink shrimp *Pandalus borealis* population on West Kamchatka

Christopher Siddon

Collaborating with the commercial fishing industry: An intensive, cost-effective method to improve red king crab stock assessments in southeastern Alaska, U.S.A.

Aimee A. Keller, W. Waldo Wakefield, Victor H. Simon, John A. Barth and Stephen D. Pierce

Environmental sampling, hypoxia and the Northwest Fisheries Science Center's Cooperative U.S. West Coast Groundfish Bottom Trawl Survey

Kazuaki Tadokoro, Yuji Okazaki, Akinori Takasuka, Tadafumi Ichikawa and Hiroya Sugisaki

Archiving historical meso-zooplankton samples collected around Japan

Poster Presentations

Igor Burago, Georgy Moiseenko, Olga Vasik and Igor Shevchenko

Sharing marine “small science” data

Orio Yamamura, Kouji Kooka and Takeomi Isono

Monitoring demersal fish community containing predators of walleye pollock using a small fishing boat

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MEQ/FUTURE Topic Session (S5)

Social-ecological systems on walleye pollock and other commercial gadids under changing environment: Inter-disciplinary approach

Co-convenors: *Keith Criddle (USA), Suam Kim (Korea), Mitsutaku Makino (Japan), Ian Perry (Canada), Yasunori Sakurai (Japan) and Anatoliy Velikanov (Russia)*

Background

In order to build bridges between scientists, decision-makers, stakeholders, and across sectors, there is a need for more in-depth and concrete inter-disciplinary research framework in the context of the PICES integrative science program FUTURE. One of the typical groundfish resources in the North Pacific, pollock is highlighted to facilitate such academic discussions under the PICES framework. Research on walleye pollock from the perspectives of ecology, biology, stock dynamics, harvesting, fisheries management, history, marketing, processing, international trade, consumption, and culture will be presented. Inter-relationships among these varied perspectives, information needs, potential values for other disciplines, *etc.*, were discussed during this session. An expected outcome of this session was a holistic framework for inter-disciplinary research, which could be applied to other species.

Summary of presentations

In order to build bridges between scientists, decision-makers, stakeholders, and across sectors, there is a need for more in-depth and concrete inter-disciplinary research in the context of the PICES integrative science program FUTURE. To facilitate such academic discussions under the PICES framework, this Topic Session highlighted one of the most prominent groundfish resources in the North Pacific: walleye pollock (*Theragra chalcogramma*). As briefly summarized below, studies on pollock and other commercial gadids from the perspectives of ecology, biology, stock dynamics, harvesting, fisheries management, history, marketing, processing, international trade, consumption, and culture were presented. The session drew about 60 participants—so that, at times, there were not enough chairs to go around. Very intensive and constructive discussions were held.

As the first presentation, Dr. Oleg A. Bulatov of VNIRO (Russia), one of two invited speakers in this Topic Session, gave a talk titled “*Walleye pollock: Global view*”. Based on decadal-scale temperature forecasts, Dr. Bulatov speculated that the world climate might cool over the coming decades (2015–2030). He anticipates that this cooling will lead to a significant reduction of stocks of northern populations of walleye pollock in the Gulf of Alaska and Bering Sea and that stocks in the Sea of Okhotsk will remain at low levels. In contrast, he anticipates that southern populations of pollock, such as those in the Sea of Japan and the Pacific coast of Japan, will increase significantly during 2020–2040. He suggested that such changes in temperature could have significant effects on the global supply of pollock to the world market.

Dr. Tetsuichiro Funamoto of Fisheries Research Agency (Japan) gave a talk on their study about comparisons of recruitment fluctuation mechanisms of walleye pollock in the Sea of Japan and the Pacific Ocean off northern Japan. He identified important factors for recruitment, such as transport, water temperature, and spawning biomass, and constructed a model to explain the recruitment mechanisms. Dr. Anatoliy Ya. Velikanov of SakhNIRO (Russia) then gave us his study titled “*Long-term changes in abundance and annual catches of walleye pollock off Sakhalin Island in the Japan/East Sea and the Okhotsk Sea: From collapse to renewal*”. He reported that a stock near western Sakhalin is deeply depressed whereas a stock near north-eastern Sakhalin has experienced abundant growth. He explained the differences in the renewal process between the two stocks. Mr. Benjamin Williams, a student at the University of Alaska Fairbanks, talked about the variations in walleye pollock maturation rates in the Gulf of Alaska, with his special interest on spatial considerations to improve estimates of spawning stock biomass.

A study by Dr. Anatoly V. Smirnov (TINRO, Russia) entitled “*Ecosystem approaches to pollock fishery management in Russia*” was presented by Dr. Mikhail Stepanenko. It dealt with the relationship between pollock and sea lions, and on other management measures that support ecosystem-based management. Dr. Hiroshi Kuroda of Fisheries Research Agency (Japan) followed with a discussion of their study using a high-resolution coastal model around the southern coast of Hokkaido on passive transport of eggs, larvae and juveniles of walleye pollock. Dr. Igor K. Trofimov (Kamchatka Research Institute of Fisheries and Oceanography, Russia) described a study on the distribution of young-of-the-year saffron cod in Karaginsky and Olutorsky Gulfs, with special emphasis on the effect of temperature. The last presentation of the morning was by Dr. Masayuki Chimura (FRA, Japan) who talked about a newly developed rearing system of larval and juvenile walleye pollock.

The afternoon session mostly dealt with various social aspects related to the pollock fisheries. Dr. Alan Haynie (NOAA Fisheries Alaska, USA), the second invited speaker, led off. His presentation “*FishSET – the spatial economics toolbox for fisheries*” was an introduction of a new modeling tool to incorporate fisher behavior into fisheries management models. FishSET can be used to organize and integrate data for spatial bioeconomic models, provide best management practices for data management, modeling, and model comparison. Also, it can be used for policy analysis.

Dr. Osamu Shida of Hokkaido Research Organization (Japan) presented research on the timing of walleye pollock spawning migration and their impacts on gill-net fishery at the coastal area. Mr. Yohei Kawauch, a student in Hokkaido University (Japan) explained the effect of environmental factors on the distributions of walleye pollock juveniles in Funka Bay and vicinity, Hokkaido, Japan. Dr. Stepanenko of TINRO-Centre (Russia) gave an informative presentation on Bering Sea pollock recruitment, abundance, and distributions, as well as the framework for fishery management measures there. Dr. Keith Criddle from the University of Alaska Fairbanks (USA) introduced the importance of game-theory analysis for analyzing cooperative and non-cooperative strategies for management of transboundary stocks of Bering Sea pollock. Mr. Masamichi Kawano (Maruha-Nichiro Ltd.) and Masahito Hirota of (FRA, Japan), described current market conditions and product distribution pathways for pollock fillet, surimi, mince, and roe. Finally, Dr. Suam Kim of Pukyong National University (Korea) talked about the pollock fisheries in Korea and the role of pollock as a food for Korean culture, domestic market conditions, *etc.*

At the presentations, there was a free-flowing discussion about inter-relationships among the topics and perspectives represented in the talks and the advancement of multidisciplinary research on fisheries. First, Dr. Yasunori Sakurai pointed out the importance of genetic biological and ecological characteristics between Pacific and Atlantic, including the possibility of conducting analyses using a “meta-population” framework for comparison. Also, taking the climate changes and stock dynamics into account, we recognized the importance of the central Bering Sea area (high sea area) in terms of international joint research and management. From the viewpoint of pollock consumption as food, maintaining stable sustainably managed supplies is paramount. In addition, the data sharing amongst PICES/ICES countries, early warning indicators for pollock recruitment regime shifts (based on the analysis like Dr. Funamoto’s presentation), *etc.*, were identified as important research issues. It was suggested that PICES-ICES cooperation might be a next step forward. In order to facilitate the academic interactions between disciplines, we discussed the potential synergies between social and natural sciences. We agreed that well-managed fisheries are well-managed biologically and well-managed from social and economic perspectives. Social and economic models need to be scalable to better match temporal and spatial scales of natural science analyses needed for management decision-making. Similarly, natural science models need to be scalable so that they can be used to support models of fishers’ behavior and the social and economic dimensions of harvest strategies and other fisheries management measures.

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List of papers

Oral presentations

Oleg A. Bulatov (Invited)

Walleye pollock: Global view

Tetsuichiro Funamoto, Osamu Shida, Kazuhiko Itaya, Orio Yamamura, Ken Mori, Yoshiaki Hiyama and Yasunori Sakurai

Comparisons of recruitment fluctuation mechanisms of walleye pollock in the Sea of Japan and the Pacific Ocean off northern Japan

Anatoliy Ya. Velikanov

Long-term changes in abundance and annual catches of walleye pollock off Sakhalin Island in the Japan/East Sea and the Okhotsk Sea: From collapse to renewal

Benjamin C. Williams, Gordon H. Kruse and Martin W. Dorn

Variations in walleye pollock (*Theragra chalcogramma*) maturation rates in the Gulf of Alaska

Anatoly V. Smirnov

Ecosystem approaches to pollock fishery management in Russia

Hiroshi Kuroda, Daisuke Takahashi, Tomonori Azumaya and Humio Mitsudera

Development of a high-resolution coastal model around Hokkaido for fisheries science-A study on passive transport of eggs, larvae and juveniles of walleye pollock

Igor K. Trofimov

About distribution of under-yearling saffron cod in Karaginsky and Olutorsky Gulfs, Bering Sea

Toru Nakagawa, Masayuki Chimura, Naoto Murakami, Takashi Ichikawa, Norio Shirafuji, Jun Yamamoto, Tetsuichiro Funamoto, Ken Mori, Yoshiaki Hiyama and Toyomitsu Horii

Establishment of a rearing system of larval and juvenile walleye pollock for elucidating their biological properties and responses to environmental changes

Alan C. Havnie (Invited)

FishSET: A new tool to better incorporate fisher behavior into fisheries management

Osamu Shida, Yukio Mihara and Kazushi Miyashita

Interannual changes in the timing of walleye pollock spawning migration and their impacts on gill-net fisheries in the southwestern Pacific coast of Hokkaido, Japan

Yohei Kawachi, Masayuki Chimura, Takashi Muto, Masamichi Watanobe and Kazushi Miyashita

The effect of environmental factors on the distributions of walleye pollock (*Theragra chalcogramma*) juveniles in Funka Bay and vicinity, Hokkaido, Japan

Mikhail A. Stepanenko

Bering Sea pollock recruitment, abundance, distribution and approach to fishery management under changing environment

Keith R. Criddle and James Strong

Straddling the line: Cooperative and non-cooperative strategies for management of Bering Sea pollock

Masamichi Kawano and Masahito Hirota

Market and distribution of walleye pollock

Suam Kim, Sukyung Kang and Dohoon Kim

The ecology of walleye pollock and its market importance in Korea

Poster presentations

Andrei N. Stroganov and Alexei M. Orlov

On the population structure of Pacific cod

Sergey S. Ponomarev

Inter-annual variability of Pollock 0-year-class abundance in the northern sea of Okhotsk

Andrey Smirnov

Correlation of pollock and herring yield broods inhabiting the northern part of the Sea of Okhotsk

Nadezhda L. Aseeva, Marina B. Shedko, Andrey Smirnov and Alexander S. Sergeev

New data on ectoparasites of walleye pollock in the Okhotsk Sea

Tadayasu Uchiyama, Gordon H. Kruse and Franz J. Mueter

Effects of water temperature increases on eastern Bering Sea juvenile pollock predation

BIO/MEQ Topic Session (S6)

Environmental contaminants in marine ecosystems: Seabirds and marine mammals as sentinels of ecosystem health

Co-sponsored by: *JSPS*

Co-convenors: *Peter Ross (Canada), Hideshige Takada (Japan) and Yutaka Watanuki (Japan)*

Background

Urban and industrial developments in the world's coastal regions have led to the release of a large number of pollutants (heavy metals, POPs, plastics, oils, radioactive substances) into the marine environment. In some cases, these have detrimental effects on variety of marine resources in coastal and offshore areas. It is increasingly important to identify sources, subsequent transport through marine physical systems and resulting spatial patterns of these anthropogenic stressors. Compared to river-lake systems, knowledge of anthropogenic stressors in marine systems is less understood due to difficulties with detection over wide areas and in offshore regions. As top predators, such as many marine mammals and seabirds, bio-magnify some of these pollutants, these organisms can be used as bio-indicators of coastal, marine and/or food web contamination. The utility of these 'sentinels' was discussed at the PICES-2011 MEQ Workshop. This session: 1) identified spatial patterns and geographic areas of concern (high concentrations) of pollutants or other stressors in the PICES region using bio-indicator species, 2) examined mechanisms of transport, and ultimate disposition, of contaminants in marine ecosystems, and 3) discussed health risks for certain predators and human consumers. Review papers, case studies, and innovative methods papers on anthropogenic stressors in marine predators were invited, as well as papers that distinguished between the effects of natural and anthropogenic stressors. In particular, studies linking predator habitat use with spatial aspects of stressors in the environment and in predators were encouraged.

Summary of presentations

Ten talks (5 from Japan, 2 from Canada, 1 from Korea, 1 from Russia, and 1 from UK,) and 4 posters (all from Russia) were given. Spatial patterns and interannual changes in POPs (Persistent Organic Pollutants), including PCBs, DDTs, HCHs, and PBDs in marine birds and some terrestrial birds were presented, and their usefulness as bio-indicators were discussed. A common theme among many of the presentations was the need to consider age and the trophic level as important factors when evaluating and comparing contaminants levels among species or populations. Case studies of monitoring marine debris ashore and POPs in plastic pellets were also presented. Forty to 50 people, including bird and mammal researchers, geochemists, and biochemists attended the session and gave useful discussion. The co-convenors discussed the potential for a review paper on the usefulness and limitation of marine birds and mammals as indicators of marine pollutants, and the spatial patterns of POPs shown by them in the PICES region.

List of papers

Oral presentations

Andy Sweetman, John Crosse, Richard Shore, Gloria Pereira and Kevin Jones (Invited)

Long term trends in PBDE concentrations in gannet (*Morus bassanus*) eggs from two UK colonies

Rei Yamashita, Hideshige Takada, Mai Miyazaki, Takashi Yamamoto, Akinori Takahashi, Maki Yamamoto, Philip N. Trathan and Yutaka Watanuki (Invited)

Persistent organic pollutants (POPs) in preen gland oils from streaked shearwaters reflect exposure in overwintering areas

Sang Hee Hong, Gi Myung Han, Won Joon Shim, Sung Yong Ha and Nak Won Heo

Concentrations and profiles of persistent organic pollutants (POPs) in birds collected from an urbanized coastal region of South Korea

Annamalai Subramanian and Shinsuke Tanabe

Developing Asian countries as sources of pollutants to the Asia-Pacific region

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John E. Elliott, Kyle H. Elliott, Melanie F. Guigueno, Laurie K. Wilson, Sandi Lee and Abde Idrissi (Invited)
Seabirds are indicators of persistent contaminants in the marine environment: Examples from the Pacific Coast of Canada

Peter S. Ross

Persistent Organic Pollutants (POPs) in marine mammals: Harmless chemicals or lingering poisons?

Vasiliy Yu. Tsygankov, Margarita D. Boyarova, Anna A. Lukashkina, Peter A. Tyupelev, Ilya A. Shcherbakov, Yuri V. Prikhodko and Olga N. Lukyanova

Marine mammals as bioindicators of persistent toxic substance (PTS) contamination in Russian Subarctic marine ecosystems

Atsuo Ito, Rei Yamashita, Hideshige Takada, Takashi Yamamoto, Kozue Shiomi, Carlos Zavalaga, Takuya Abe, Shinichi Watanabe, Maki Yamamoto, Katsufumi Sato, Hiromi Kohno, Ken Yoda, Tomohiko Iida and Yutaka Watanuki

POPs in the preen gland oil of streaked shearwaters breeding on the islands in Japan reflect marine pollution in western North Pacific

Atsuhiko Isoke, Shin'ichiro Kako and Etsuko Nakashima (Invited)

Marine/beach plastic litter as a transport vector of pollutants

Kosuke Tanaka, Hideshige Takada, Rei Yamashita and Yutaka Watanuki (Invited)

Marine plastics: Monitoring matrix for persistent organic pollutants (POPs) and carrier of POPs to seabirds

Poster presentations

Andrey S. Neroda, Vasily F. Mishukov, Vladimir A. Goryachev, Denis V. Simonenkov and Anna A. Goncharova

Radioactive isotopes in atmospheric aerosols over Russia and the Sea of Japan following the nuclear accident at Fukushima nr. 1 Daiichi nuclear power station in March 2011

Tatiana Chizhova, Pavel Tishchenko, Liubov Kondratieva and Takuya Kawanishi

Polycyclic aromatic hydrocarbon (PAH) distribution in the Amur River estuary

Yulia Koudryashova, Natalia Prokuda, Natalia Khodorenko, Tatiana Chizhova and Pavel Tishchenko

PAHs in sediments of rivers of the Primorsky Region, Far East of Russia

Mikhail V. Simokon

Ecological risk evaluation of metals in the coastal areas of Peter the Great Bay, Japan/East Sea

BIO/FIS Topic Session (S7)

Jellyfish in marine ecosystems and their interactions with fish and fisheries

Co-sponsored by: *ICES*

Co-convenors: *Richard Brodeur (PICES/USA), Cornelia Jaspers (ICES/Denmark), Christopher Lynam (ICES/UK), Song Sun (PICES/China), Shin-Ichi Uye (PICES/Japan) and Won-Duk Yoon (PICES/Korea)*

Background

Evidence is accumulating that gelatinous zooplankton populations have increased substantially in many regions of the world, most likely through anthropogenic stresses, but we have insufficient understanding of how these blooms affect fish and, more broadly, marine ecosystems. Some benefits of jellyfish to marine fish include provisioning of food for some species and shelter for juvenile stages of several others. There is also a relatively minor human benefit in that some jellyfish are both commercially fished and cultured for human consumption in several countries. However, the negative effects of jellyfish population outbursts are thought to greatly exceed any positive ones and their effects on ecosystems and the economies that depend on them can be profound. These effects have been examined through field studies, controlled laboratory experiments, and estimated using quantitative ecosystem models. Jellyfish are generally detrimental to fish because they feed on zooplankton and ichthyoplankton, and so are both predators and potential competitors of fish. Relatively little of the energy consumed by gelatinous zooplankton ends up at higher trophic levels of interest to humans compared to krill and forage fishes. Jellyfish blooms also directly impact commercial fisheries through filling or clogging trawls and fouling fixed gear and aquaculture net pens, resulting in enormous economic losses worldwide. This session focused on empirical field, laboratory, or modeling studies that examine the effects jellyfish have on marine ecosystems, fish species and fisheries, and relevant ecosystem-based management issues important to the needs of society over wide-ranging space and time-scales up to and including climate variations.

Summary of presentations

Studies presented at this meeting indicate that ecosystem degradation in diverse systems such as the Irish Sea, Sea of Japan, and Gulf of Mexico, coupled with climatic changes can be linked to elevated jellyfish abundances. Some synchrony in jellyfish time-series was evident across the world's oceans, in particular between such seemingly unrelated systems as the Adriatic Sea and Inland Sea of Japan. More co-ordinated research effort is necessary to substantiate these general observations and future collaborations between Pacific and Atlantic scientists were discussed, including the possibility of a joint ICES/PICES Working Group.

While climate trends were clear in many of the data sets presented, it is still highly debated which factors and mechanistic processes drive the observed variability in gelatinous zooplankton biomass between the years and decades. Several examples highlighted the relationship between fish landings, their historic reduction due to overfishing and subsequent trends of increasing jellyfish populations. This indicates an indirect interaction between fishing impacts and jellyfish biomass and potentially of importance is the trophic level that the fisheries target. However, it was highlighted that for many years the willingness by fisheries management to consider indirect linkages of fisheries to gelatinous zooplankton has been limited.

Many risks (from reduced tourism to disruption to power plant coolant systems) associated with the threat of rising jellyfish populations were identified during the meeting and these risks should be communicated to managers and policy makers directly. If jellyfish population sizes are to be managed and outbreaks prevented, then the threat posed by jellyfish to fish, fisheries and other activities must be considered within the ecosystem approach to fisheries management.

An interesting approach to manage the consequences of giant *Nemopilema nomurai* blooms was presented where the implementation of diel vertical migration and temperature into a drift model study helped to accurately predict the dispersal of *N. nomurai* in the Sea of Japan, which is crucial information for the fishermen in the respective regions to prevent damage to their equipment.

The interaction between jellyfish and fish can be complex and include bottom-up and top-down pathways. Regarding bottom-up processes, several talks and posters addressed the reproduction potential in relation to hydrographical and environmental features. The polyp stage and/or egg production rates are critical factors determining the next generations' population size. In this context, the continued creation of artificial hard substrates is of paramount importance. Even a relatively small floating pontoon (6 × 48 m) recently installed in Japanese waters had been found to generate many million young medusoids within a year of installation. It was reported that a treatment to stop such biofouling was in development and shows some promise.

A notable example of the problem of biofouling by polyps on salmon aquaculture facilities, especially in northern Europe, was described. Polyp colonies grow on the cages and this commonly leads to salmon gill disorders and reduced aquaculture revenues. More dramatically, mass mortalities of salmon have occurred owing to jellyfish outbreaks drifting into salmon pens and technological developments (bubble nets, early warning systems) have been used to combat this problem. It was further shown that polyp settling is highly dependent on salinity and has been restricted to high saline areas in Chinese river runoff-influenced lagoons, thereby limiting their settling opportunities and reproductive potential. Similarly, salinity effects on reproduction rates have been documented to restrict the range expansion of the invasive ctenophore *Mnemiopsis leidyi*. This information could be used for determining site locations of large projects introducing artificial hard substrates (e.g., windfarms) which might be better located in low salinity areas where polyp settling is restricted. However, in general bottom-up processes need to be further investigated and the monitoring of ephyra in addition to medusae should be conducted since they are commonly ignored in zooplankton investigations.

From a top-down aspect, it was addressed and experimentally confirmed that many species of fish prey on jellyfish. For several fish species in Japanese waters, it has been shown that gelatinous food sources promote growth and in some cases, are even essential in the fish diet to sustain high growth rates. Similarly, certain

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commercially important salmon species (*e.g.*, chum salmon, *Oncorhynchus keta*) depend on a ctenophore diet during their development in the North Pacific. However, the responses are species-specific and much more research is required in this area. Gelatinous species are typically digested so rapidly that they can appear absent from the gut contents of fish even if the fish have fed on them within an hour. To avoid this problem, molecular and genetic tools for gut content analyses, especially for commercially important fish species, should be employed more often to confirm the extent of jellyfish and ctenophores in their diets. Diets of potential jellyfish predators should be examined on fresh material at sea whenever possible.

In conclusion, jellyfish threats to aquaculture, fisheries, tourism, and power generation are well known and the risks should be quantified. The trade-off between potential losses and the cost of mitigation should be considered and the acceptable risk levels evaluated. Ecosystem degradation and climatic changes alongside increased usage of the marine environment by man are likely to stimulate further outbreaks of gelatinous zooplankton populations and detrimental impacts by jellyfish may become more common. The development of the ecosystem approach to fisheries management provides a framework in which to address and tackle these issues.

List of papers

Oral presentations

William M. Graham, Stefan Gelcich, Carlos M. Duarte, Shin-ichi Uye, Richard Brodeur, Robert H. Condon and NCEAS Jellyfish Working Group (Invited)

Jellyfish and fisheries: Risks, trade-offs and adaptations

Thomas K. Doyle, Emily J. Baxter, Graeme C. Hays, Hamish D. Rodger and Neil M. Ruane (Invited)

Detrimental impacts of jellyfish on finfish aquaculture: insights from the North East Atlantic

Reiji Masuda, Yuko Miyajima, Ryosuke Ohata and Yoh Yamashita (Invited)

Jellyfish as a predator and prey of fishes: Underwater observations and rearing experiments

Jennifer E. Purcell, Ana Sabatés, Verónica Fuentes, Francesc Pagès, Uxue Tilves, Alejandro Olariaga and Josep-María Gili

Predation potential of blooming jellyfish, *Pelagia noctiluca*, on fish larvae in the NW Mediterranean Sea

Cornelia Jaspers

The invasive ctenophore *Mnemiopsis leidyi* in northern European waters and its potential impact on fisheries

Shin-ichi Uye, Alenka Malej and Tjasa Kogovsek

Comparative analysis of the Inland Sea of Japan and the northern Adriatic: Can changes in anthropogenic pressures disclose jellyfish outbreaks?

Martin K.S. Lilley, Steven E. Beggs, Thomas K. Doyle, V.J. Hobson, K.H.P. Stromberg and Graeme C. Hays

Direct and indirect evidence for massive differences in jellyfish biomass between the Pacific and Atlantic: Implications for fisheries bycatch?

Lucas Brotz, William W.L. Cheung, Reg Watson, Kristin Kleisner, Evgeny Pakhomov, Philippe Cury, Roxane Maranger, Brooke Campbell and Daniel Pauly

Anthropogenic impacts related to observed increases of jellyfish populations

Christopher P. Lynam, Martin K.S. Lilley, Thomas Bastian, Thomas K. Doyle, Steven E. Beggs and Graeme C. Hay

Have jellyfish in the Irish Sea benefited from climate change and overfishing?

Alexander V. Zavolokin

Jellyfish of the Far Eastern Seas of Russia: Composition, spatio-temporal variations and significance for ecosystems

Song Sun, Chaolun Li, Guangtao Zhang, Shiwei Wang and Xiao Xia Sun

Giant jellyfish blooms in the Yellow Sea and East China Sea

Akira Okuno, Tatsuro Watanabe, Satoshi Kitajima, Naoto Honda and Katsumi Takayama

Numerically simulated migration/distribution of *Nemopilema nomurai* in the Japan Sea using temperature-based controls

Masaya Tovokawa, Akira Yasuda, Yusuke Murata, Kazuhiro Aoki, Manabu Shimizu and Minoru Hamada

Aurelia swarms originate from polyps near the mouth of a bay: evidence from Mikawa Bay and Ise Bay

Mary Needler Arai

Predation on gelatinous cnidaria and ctenophores

Brian E. Smith and Jason S. Link

The presence of gelatinous zooplankton in the diets of fishes of the Northeast U.S. continental shelf: Trends in shelf-wide feeding and consumptive removals

James J. Ruzicka, Elizabeth A. Daly and Richard D. Brodeur

Salmon and jellyfish: Bumping elbows in the Northern California Current

John C. Field Jarrod A. Santora Keith Sakuma Amber Payne and Baldo Marinovic

Spatial and temporal patterns of variability in Scyphomedusae in the central California coastal marine ecosystem

Richard D. Brodeur, Mary Beth Decker, Elizabeth A. Daly, Caren Barcelo, James J. Ruzicka and Kristin Ciciel

A tale of two *Chrysaora*: Pivotal roles in contrasting marine ecosystems

Poster presentations

Sim Yee Kwang, Chuah Chern Chung, Anita Talib and Khairun Yahya

Exogenous impacts on the massive occurrence of jellyfish in the northern part of Malacca Straits, Malaysia

Wen-Tseng Lo, Hung-Yen Hsieh and Shwu-Feng Yu

Comparison of siphonophore assemblages during northeasterly and southwesterly monsoon seasons in the Taiwan Strait, western North Pacific Ocean

Ryosuke Makabe, Ryuji Furukawa, Mariko Takao and Shin-ichi Uye

Marine construction as a factor boosting *Aurelia aurita* s.l blooms: A case study of a new floating pier deployment in Hiroshima Bay, Japan

Takashi Kamiyama

Planktonic ciliates as a prey source for moon Jellyfish *Aurelia aurita*: Feeding activities and growth effects of ephyra and metephyra stages

Satoshi Kitajima, Akira Okuno, Naoki Iguchi, Naoto Honda, Tatsuro Watanabe and Osamu Katoh

Low temperature excludes medusae of *Nemopilema nomurai* in the Japan Sea in winter

Thomas Bastian, Damien Haberlin, Mary Catherine Gallagher, Sean Rooney, Graeme C. Hays and Thomas K. Doyle

Tracking the lion's mane jellyfish: Horizontal and vertical movements of *C. capillata* (Scyphozoa) in a shallow coastal environment

Steven E. Beggs, Thomas Bastian, Martin K.S. Lilley and Thomas K. Doyle

Annual and regional variations in associations between Scyphomedusae and juvenile gadoids in the Irish Sea

Martin K.S. Lilley and F. Lombard

Developing a technique for *in-situ* monitoring of fragile planktonic organisms

Kristin Ciciel, Jeanette Gann and Bruce Wing

Methods for conducting individual measurements on trawled jellyfish

Naoki Fujii, Shinya Magome, Atsushi Kaneda and Hidetaka Takeoka

Relationship between jellyfish abundance and environmental fluctuations in Uwa Sea

Jun Nishikawa, Fatimah Md. Yusoff, Nguyen Thi Thu, Khwanruan Srinui, Mulyadi and Shuhei Nishida

Jellyfish fisheries in Southeast Asia

POC/FIS Topic Session (S8)

Linking migratory fish behavior to End-to-End models II

Co-convenors: *Enrique Curchitser (USA), Shin-ichi Ito (Japan) and Michio Kishi (Japan)*

Background

In order to understand ecosystem response to climate impacts, End-to-End modeling (E2E) approaches are essential. One of the most difficult parts for E2E is the modeling of fish migration. Fish behavior can be very complex; it is a consequence of genetics, physical, chemical and biological environments and their interaction. Learned behavior may also be a factor. To model fish behavior, integrated studies are needed including laboratory experiments, tagging and acoustic observations, and modeling. The purpose of this session was to review the current state of development in laboratory experiments, field observations and modeling to understand fish behavior and to discuss future potential collaborations to improve fish migration models.

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Summary of presentations

Co-convenor, Dr. Shin-ichi Ito, introduced the session to the audience highlighting that this is a follow-on to two previous PICES sessions on the topic and is considered an important component of future efforts in modeling the upper trophic levels. The half-day session attracted over 50 attendants.

Invited speaker, Dr. Robert Humston, presented an overview of different methods for modeling fish movement. He started with a statement on the importance of understanding fish movement if we are to be able to predict ecological changes. He stated that behavioral mechanisms determine pathways, which are critical to scaling up to population-level impacts. However, he noted that exact mechanisms are unknown and must be approximated. Dr. Humston explained the difference between four different movement methods: Random walk, Kinesis, Taxis and Area Search. He stated that Kinesis may be inefficient relative to gradient-based methods but he preferred it due to its superior results. He spent described the results with the Kinesis algorithm as well as some discussion explaining why fish move and how we may be able to program that behavior.

Dr. Albert Hermann, on behalf of Dr. Ivonne Ortiz, described work being done with the model FEAST, where movement is based on gradients of “happiness” based mostly on the availability of prey. Dr. Seokjin Yoon described an individual-based modeling approach for Pacific saury migrations, which links environmental data to a bioenergetics model to a migration module and finally to an IBM. Other speakers presented results of implementing different types of behavior to a variety of species, from larvae to adult fish in different environments.

List of papers

Oral presentations

Robert Humston (Invited)

Selecting appropriate models of fish movement for End-to-End models of marine ecosystems

Ivonne Ortiz, Kerim Aydin and Albert J. Hermann

20 species, 15 lengths: How fish move driven by happiness as defined by growth and predation

Seokjin Yoon, Terui Takeshi, Michio J. Kishi and Shin-ichi Ito

An individual-based modeling approach for Pacific saury migrations

Yoshioki Oozeki, Takeshi Okunishi, Akinori Takasuka and Daisuke Ambe

Annual change in migration pattern of Pacific saury larvae from spawning to nursery grounds

Masanori Takahashi, Atsushi Kawabata, Chikako Watanabe, Michio Yoneda, Daisuke Ambe and Takeshi Okunishi

Migratory behavior and recruitment process of the Pacific stock of chub mackerel *Scomber japonicus*

Tohya Yasuda, Ryuji Yukami and Seiji Ohshimo

Changes in spatial distribution of chub mackerel under climate change: The case study using Japanese purse seine fisheries data in the East China Sea

Jung Jin Kim, William T. Stockhausen, Yang-Ki Cho, Gwang Ho Seo and Suam Kim

Transport processes of eggs and paralarvae of Japanese common squid, *Todarodes pacificus* in the Northwest Pacific

Akira Okuno, Tatsuro Watanabe, Naoto Honda, Katsumi Takayama, Naoki Iguchi and Satoshi Kitajima

Importance of swimming-depth model of jellyfishes *Nemopilema nomurai* in simulation of their migration in the Japan Sea

Satoshi Nakada, Takashi Uenaka, Ken-ichi Kitao, Kenta Matsui, Yoichi Ishikawa, Naohisa Sakamoto, Koji Koyamada, Toshiyuki Awaji and Sei-Ichi Saitoh

Estimated migration of scallop larvae in Funka Bay by using streamline visualization

Poster presentation

Michio J. Kishi

Discussions on random walk and behavioral movement models coupled with NEMURO. FISH: Case study on chum salmon and saury

FIS/MEQ Topic Session (S9)***Ecological functions and services associated with marine macrophyte communities as indicators of natural and anthropogenic stressors in nearshore zones of the North Pacific***

Co-convenors: Ik-Kyo Chung (Korea) and Jun Shoji (Japan)

Background

Diverse communities of marine and estuarine macrophyte vegetation including kelp beds, seaweeds, macrobenthic algae, seagrasses, and salt marshes occur along the coastlines of the PICES member countries. In addition to the direct primary production of organic material into marine ecosystems, these macrophytic communities are also considered as ecological engineers that can have important indirect supporting roles in the lives of heterotrophic organisms such as fishes, shellfish, seabirds, and other marine organisms. Seasonal growth and breakdown of macrophytic vegetation has important implications for the biochemistry of essential nutrients in the nearshore zones, and for the interactions among vertebrate and invertebrate members of marine and estuarine communities. Fluctuations in physical and chemical parameters such as sea water temperature, salinity, nutrient availability, incident light levels, water flow, and sediment conditions contribute as complex regulating factors toward the establishment and persistence of macrophyte communities. In contrast, the physical structure of the macrophytes themselves can modify the local environment, affect the composition and abundance of their associated organisms, and provide essential ecological roles as recruitment sites, nursery areas, foraging habitats, and sinks for marine carbon. These interactions among ambient environmental parameters, macrophytes, and their associated organisms are collectively known as ecosystem functions and services, which are influenced not only by natural forces but also by anthropogenic stressors. This topic session focused on the ecological functions and services provided by diverse communities of macrophytes throughout the North Pacific coastal zone.

Summary of presentations

Topic session 9 had a total of 8 talks with over 30 attendees in the audience. Talks on very diverse topics concerning the ecological aspects of coastal seascape such as rocky shores, seagrass beds, salt marshes as well as economic value were presented. Invited speaker, Dr. Masakazu Hori, focused on the landscape/seascape structure. He demonstrated the enhancement of secondary production by temporal niches complementary with seascape diversity using mesocosm experiments with fish, seagrass, kelp and bivalves. Dr. Nam-Il Won showed strong benthic pelagic coupling with *Sargassum* associated benthic diatoms, *Carprella* spp. and fish feeding linkage based on field and isotope analyses. Mr. Tsutomu Noda presented a 3-year study of the before and after tsunami event in 2011 and recommended continuous monitoring and research. Ms. Shiori Sonoki discussed a new method to determine the biomass of a seagrass bed using a small quantitative echosounder, KCE-300 (Kaijo Sonic Corporation, 120kHz) and an ROV (Pro3, VideoRay) for identifying species and growth conditions with an Arc GIS (ESRI Corporation, ver. 10) technique. She applied this tool to measure oxygen production. Dr. Katsumasa Yamata elaborated on a valuable concept of functional diversity and functional redundancy of the faunal community in a seagrass ecosystem. Functional strength of a community and ecosystem functioning (Ecosystem service) could be evaluated by these concepts. Emergent functions of the macrofaunal community seem attributable to flexible functional changes among species, and even among individuals. He concluded that Forming Meta-communities of macrofaunal species with Functional Redundancy (FR) among patches could provide resilience. Dr. Sang Rul Park showed the role of the salt marsh, Blue Carbon, as a net sink of CO₂ except in the winter season based on the carbon budget in the southwestern Gulf of Mexico. Dr. Ekaterina Golovashchenko introduced the economic value of ecological functions and services associated with marine macrophyte communities and other natural resources and its practical use in Kievka Bay. Dr. Seokjin Yoon talked about the incorporation of a kelp factor into the NEMURO model for the Kelp-controlled environment. In the poster session, Dr Chunjiang Guan showed a high rate of nutrient removal by salt-resistant plants on the Bohai Sea coast. Dr. Park showed that the effects of intensity and season of disturbance on the benthic community were dependent of the timing of the event. Dr. Chang Geun Choi discussed a restoration method with seaweeds on the artificial reef.

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List of papers

Oral presentations

Masakazu Hori (Invited)

Effect of coastal seascape diversity on associated fish production

Nam-Il Won, Hideki Takami, Yutaka Kurita, Daisuke Muraoka and Tomohiko Kawamura

Trophic structure of the rocky shore ecosystem in Otsuchi Bay, Japan: Implications for benthic–pelagic coupling

Tsutomu Noda, Yoshitomo Nagakura, Daisuke Shimizu, Hideaki Aono, Hiroyuki Okouchi, Masami Hamaguchi, Atsushi Fukuta, Yasuhiro Kamimura and Jun Shoji

Impact of the tsunami from the Great East Japan Earthquake on seagrass beds and fish assemblages in Miyako Bay

Shiori Sonoki, Yuka Morita, Jun Syoji and Kazushi Miyashita

Monitoring seasonal variations in a seagrass bed by an acoustics method

Katsumasa Yamada (Invited)

Functional diversity and functional redundancy of a faunal community in a seagrass ecosystem of northern Japan

Sang Rul Park, Joseph Stachelek and Kenneth H. Dunton

The role of salt marsh plants as a net sink or source for carbon dioxide in the southwestern Gulf of Mexico

Ekaterina V. Golovashchenko

The economic value of ecosystem services in Kievka Bay (Japan Sea)

Seokjin Yoon, Michio J. Kishi, Satoshi Nakada, Yoichi Ishikawa, Tomonori Isada and Sei-Ichi Saitoh

Ecological functions of a kelp community as an indicator of anthropogenic nutrient stressors

Poster presentations

Chunjiang Guan, Jie Na, Meng Xu and Xiutang Yuan

Studies on carbon, nitrogen, and phosphorus uptake fluxes by *Suaeda salsa* around the Bohai Sea District

Ivan I. Cherbady and Ludmila I. Sabitova

Influence of environmental factors on ammonium and phosphate uptake rates by a red alga (*Ahnfeltia tobuchiensis*) population in Izmena Bay (Kunashir Island)

Yun Hee Kang, Chang Jae Choi and Sang Rul Park

Effects of intensity and season of disturbance on the marine benthic community of a rocky intertidal shore with a periodic green tide occurrence in Korea

Chang Geun Choi and Seok Jin Oh

Development of artificial seaweed bed for ecological restoration

BIO/MEQ/FUTURE Topic Session (S10)

Ecosystem responses to multiple stressors in the North Pacific

Co-sponsored by: *SOLAS*

Co-convenors: *Vladimir Kulik (Russia), Ian Perry (Canada) and Motomitsu Takahashi (Japan)*

Background

Marine ecosystems of the North Pacific, both coastal and offshore, are influenced by multiple stressors, such as increased temperature, change in iron supply, harmful algal blooms, invasive species, hypoxia/eutrophication, ocean acidification, and intensive fishing. These multiple stressors can (but do not always) act synergistically to change ecosystem structure, function, and dynamics in unexpected ways that can differ from responses to single stressors. Further, these stressors can be expected to vary by region and over time. This session seeks to understand the responses of various marine ecosystems to multiple stressors and to identify appropriate indicators of these effects. Contributions were invited which reviewed and defined categories of indicators to document the status and trends of ecosystem change at a variety of spatial scales (*e.g.*, coastal, regional, basin) in response to multiple stressors. Emphasis was placed on empirical and theoretical approaches that forge links between ecosystem change and the intensities of multiple stressors. This session was a contribution to the work of PICES WG 28 on [*Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors*](#).

Summary of presentations

Session S10 was held on Friday, October 19, 2012 (half day). It was launched with an invited speaker, Natalie Ban (Australian Research Council Centre of Excellence for Coral Reef Studies, Australia) and included 5 other oral presentations, 8 poster presentations, and time for discussion.

Dr. Ban discussed issues related to mapping cumulative impacts, including advances, relevance and limitations to marine management. She began by noting there is global concern about multiple stressors and currently a lot of interest in mapping where multiple stressors might be interacting. She identified the purpose of her presentation as providing examples of methods and data for mapping multiple stressors in a given region. She concluded that such approaches do provide informative uses of existing data and information, baselines for future mapping, new opportunities to improve mapping approaches, but cautioned that there is a need to ground-truth these mapping efforts. She also recommended caution when scores for the vulnerabilities of different habitats to different stressors developed in one region (*e.g.*, the California Current system) are applied to a different region (*e.g.*, the coast of British Columbia) without critical consideration of their “transferability”. An important next step in these types of habitat vulnerability analyses is the use of Bayesian methods to assess multiple stressors, which are now being investigated in some coral reef regions. Discussion following her presentation included how to move from GIS analyses of multiple stressors to impacts; it was noted that some of this needs to come from directed studies of impacts. However, such studies currently often examine only one stressor at a time.

Dr. Ian Perry, with co-author Dr. Jennifer Boldt, provided an example of a study to identify multiple stressors on multiple habitats in a specific region, the Strait of Georgia, British Columbia, featuring the early work of Working Group 28. The objectives of his study were to develop a structured process to identifying multiple stressors in the Strait of Georgia, and the responses of selected (key) habitats to these stressors, to identify which habitats might be more vulnerable to which stressors, and to provide base information that is needed to develop indicators of ecosystem responses to multiple stressors in this area. He described a GIS-based approach to identify which stressors occur in the Strait of Georgia and how they might impinge upon various habitats, and then described an expert-based project to identify the potential vulnerabilities of these habitats to which stressors. He concluded that considerable (but not complete) information is available for the Strait of Georgia on spatial patterns of important marine habitat features and human stressors, that we are beginning to understand the knowledge gaps concerning measures of habitat vulnerability and resilience, and that expert surveys are one method to obtain information but they need to be cross-linked with empirical data. Ecosystem models may provide useful “platforms” to understand ecosystem responses to multiple stressors, but they also need to be supported and cross-checked with empirical data and expert surveys. This type of analysis does not permit inclusion of temporal trends in stressors, which can be important in assessing current conditions when the information base is from past conditions.

Mr. Vladimir Kulik provided a detailed and thorough statistical analysis of mapping cumulative human and natural impacts in the Sea of Okhotsk, based on the monitoring of energy emissions from fishing activities. He derived time series of this information and applied statistical analyses to extract the dominant underlying features and trends. Planned activities include additional stressors such as SST and sea ice, adding nearshore human activities (specifically small-scale fishing), involving experts in a survey to get weights for ecosystem vulnerability, clustering the bottom area by ground type and depth, and summarizing impact scores by clusters.

Dr. Motomitsu Takahashi and co-authors provided an initial comparative study of ecosystem responses to anthropogenic activities and natural stressors among inland, shelf and oceanic waters around Japan. They used the expert-based screening method developed by Working Group 28 to identify the impacts of human activities and natural stressors in each of these regions. They then compared the outcomes from the expert-based approach with observed data. They concluded that increasing sea temperatures affect all three ecosystems, that coastal development and engineering have strong impacts on the East China Sea and the Seto Inland Sea, that demersal and pelagic fishing impacts the East China Sea and the Kuroshio/Oyashio region, respectively, and that nutrient inputs have synergistic impacts to Harmful Algal Blooms and hypoxia. They also identified

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problems with the expert-based scoring method, including that the certainty of the experts on the impacts differ among ecosystems because of the quality and quantity of information available, that the evaluation of impacts can differ among experts with different experience and expertise, that more information in the intertidal and coastal waters along China are needed for the East China Sea region, and that for oceanic waters, a lack of information may preclude appropriate evaluation of ecosystem responses.

Dr. Mingyuan Zhu and co-authors examined ecosystem changes under multiple stressors in the Yellow Sea, including the natural environment of Yellow Sea and East China Sea, their multiple stressors, the resulting changes in pelagic and benthic communities, and the consequent response of the ecosystems. They concluded that multiple stressors on the ecosystems of these Chinese seas occur from both climate change and anthropogenic activities and that they are increasingly severe, that there are clear ecosystem changes as evidenced by loss of biodiversity, declines in living marine resources, increasing HABs, “green tides”, jellyfish blooms, *etc.*, and that further studies and management actions to reduce environmental stresses are urgently needed.

The presentation by Mr. Kyung-Su Kim and co-authors received the Best Paper award from the MEQ Committee (see the end of Session Summaries for the list of recipients). They examined the combined effects of elevated carbon dioxide concentrations and temperature on the development of olive flounder, the most important aquaculture species in Korea. It provided an example of the type of directed study that is needed to begin to understand the joint effects of more than one stressor. They concluded that larval growth was similar at the two lower CO₂ concentrations examined and within the range of seawater temperature range of 18~22°C, but that growth was enhanced at the highest CO₂ concentration at both temperatures. They also noted that the calcium component in larval bone was significantly increased at the highest CO₂ concentration. This study provided a nice example of the (often) non-linear relationships that can occur with multiple stressors interact.

General discussion considered whether these expert-based survey approaches should be done with a regional or global focus, *i.e.*, whether the respondents should be asked to consider just the range of values and experiences in a particular geographic region or on a global comparison. No consensus was reached other than to note this question can be important and should be considered in such surveys and their questions. In addition, how can the impacts of multiple stressors on habitats be examined when more than two stressors are occurring? For example, Perry and Boldt found that the mode number of stressors on any 4 km² region in the Strait of Georgia was between 20 and 25. When developing indices for multiple stressors, they need to be “simple” but at the same time allow for users to “drill down” to obtain more details about how particular sets of stressors might be driving particular responses in habitats. An important shortcoming in these approaches was noted regarding temporal changes, and how to update the analyses. A stepwise process was recommended, involving identification of habitats, stressors, and their vulnerabilities, noting that these vulnerabilities of specific habitats to different stressors likely do not need to be updated on a regular basis. Updates for new time periods would then use the established vulnerabilities and simply update the stressor information.

List of papers

Oral presentations

Natalie C. Ban, Stephen S. Ban and Hussein M. Alidina (Invited)

Mapping cumulative impact: Advances, relevance and limitations to marine management and conservation in Pacific Canada, and emerging Bayesian approaches

R. Ian Perry and Jennifer Boldt

Identifying multiple stressors and potential habitat responses in marine ecosystems of Pacific Canada

Vladimir V. Kulik

Mapping cumulative human and natural impacts in the Sea of Okhotsk

Motomitsu Takahashi, Sachihiko Itoh, Naoki Yoshie, Kazuhiko Mochida, Masakazu Hori and Shigeru Itakura

Comparative study on ecosystem responses to anthropogenic activities and natural stressors among inland, shelf and oceanic waters around Japan

Mingyuan Zhu, Ruixiang Li and Zongling Wang

Ecosystem Changes under multi-stressors in the Yellow Sea

Kyung-Su Kim, JeongHee Shim and Suam Kim

The combined effects of elevated carbon dioxide concentration and temperature on the early development stage of olive flounder *Paralichthys olivaceus*

Poster presentations

Evgeniya Tikhomirova

Typical distributions of primary production at the surfaces of Peter the Great Bay (Japan Sea)

Kanako Naito, Setsuko Sakamoto, Mineo Yamaguchi, Ichiro Imai and Ken-ichi Nakamura

Iron as a triggering factor for harmful dinoflagellate blooms

Aya Morinaga and Kazumi Matsuoka

Eutrophication suggested by the heterotrophic signal of dinoflagellate cyst assemblages; Case of Omura Bay, West Japan

Yuta Inagaki, Tetsuya Takatsu, Masafumi Kimura, Yota Kano, Toyomi Takahashi, Yoshihiko Kamei, Naoto Kobayashi and Tatsuaki Maeda

Effects of hypoxia on annual changes in growth and somatic condition of flathead flounder *Hippoglossoides dubius* in Funka Bay, Japan

Tetsuya Takatsu, Koji Shinoda, Shoichi Inoue, Tomofumi Seta and Yuta Inagaki

Drastic reduction of demersal fish abundance by hypoxia in Mutsu Bay Japan in the fall of 2011

Stephani Zador and Kirstin Holsman

Identifying and comparing ecosystem stressors in the eastern Bering Sea and Gulf of Alaska

Yumiko Yara, Meike Vogt, Masahiko Fujii, Hiroya Yamano, Claudine Hauri, Marco Steinacher, Nicolas Gruber and Yasuhiro Yamanaka

Ocean acidification limits temperature-induced poleward expansion of coral habitats

Anastasiia Strobykina

Spatial and temporal variability of nutrients in the Okhotsk Sea shelf zone

MONITOR/POC Topic Session (S11)

Effects of natural and artificial calamities on marine ecosystems and the scheme for their mitigation

Co-sponsored by: *JSFO and FRA*

Co-convenors: *Michael Foreman (Canada), Toyomitsu Horii (Japan), Vladimir Kulik (Russia), Phillip Mundy (USA), Sei-ichi Saitoh (Japan), Hiroya Sugisaki (Japan) and Tokio Wada (Japan)*

Background

From ancient times, we have been discussing and taking countermeasures on revival of fisheries and social infrastructures of waterside from natural disasters such as tsunamis and floods. The earthquake (Magnitude 9.0) that occurred in northeastern Japan on the 11th of March, 2011, was beyond our imagination. The earthquake and the subsequent gigantic tsunami destroyed the regional fisheries and surrounding society, and impacted marine ecosystems in eastern Japan. The tsunami also damaged the nuclear power plant of Fukushima, posing a serious threat to the North Pacific ecosystems due to the radioactive contamination of the ocean. Other recent examples of disasters which caused serious problems of environmental pollution for the marine ecosystems are hurricane Katrina in 2005, and the oil spill of the Gulf of Mexico in 2010. The magnitude of climatic disasters such as storms and floods may have been enhanced due to global warming. Since oil refineries, factories, power plants and other industrial infrastructures are often built in the coastal areas of the world, coastal ecosystems are vulnerable to natural and artificial disasters. For the wise use of ecosystem services, it is urgent and important to reveal the effects of natural and artificial disasters on marine ecosystems, to document their restoration processes, and to promote effective measures for restoration and mitigation of disaster impacts. The purposes of this session were to discuss: (1) the effect on the marine ecosystem by disasters, (2) the effect on the marine industries and societies by disasters, (3) schemes for the

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mitigations and recoveries from the disasters, (4) field monitoring on the effect and the process of recoveries, (5) domestic and international cooperation, and (6) policy and its effect.

Summary of presentations

This session was held to exchange information on current research on natural and artificial ecosystem disturbances, which was a particularly timely topic for a meeting in Japan so soon after the Great East Japan Earthquake of 2011. An audience of about 100 people heard 14 oral presentations, 5 of which were invited, while 7 posters were presented in the PICES poster session.

After the opening address by Dr. Tokio Wada (S11 Co-convenor; Vice-president of the Japanese Society of Fisheries Oceanography, and the Executive Director of the Fisheries Research Agency), Dr. Hiroya Sugisaki introduced the purpose of the session. The opening paper, "*Exxon Valdez: Long term environmental consequences of oil persistence and toxicity*" by Dr. Stanley Rice, an invited speaker, was made by Dr. Rice's colleague, Dr. Phillip Mundy, as Dr. Rice was unable to travel to the meeting. As the only presentation on artificial ecosystem disturbances, the talk addressed the history of more than two decades of efforts to identify and address oil induced disturbances. The importance of long-term monitoring for understanding disturbances in marine environments was a major conclusion of the talk. In the next talk, Dr. Hiroya Sugisaki (on behalf of the Japanese Society of Fisheries Oceanography) introduced the projects implemented to identify disturbances arising from the Great East Japan Earthquake that were enabled by the PICES/ICES/JSFO fund for fisheries and oceanographic research in the area.

In the second part of the morning session, Dr. Shin-ichi Ito, an invited speaker, represented 18 co-authors in providing an overview of the damages to the fishing industries and living marine resources of the nearshore areas that were caused by the earthquake and the resulting tsunami and massive debris input to the marine environments. Two subsequent talks described surveys of disturbances to important nearshore marine habitats, the eel grass (*Zostera*) meadows (Dr. Daisuke Muraoka) and the rocky shore and near subtidal areas (Dr. Hideki Takami). In the final talk of the morning, Dr. Atsushi Tsuda (on behalf of Mr. Hiroshi Isami) introduced their research activities on the effect of the earthquake and tsunami on the zooplankton communities in the nearshore ecosystems in Tohoku region. The need for long-term monitoring in the marine environment was frequently mentioned in these talks.

In the afternoon session, Dr. Masahiro Yamao, an invited speaker, shared lessons learned from research on the effect of the tsunami of Sumatra, as a potential model for the roles of sustainable livelihood recovery and social resilience in areas affected by the Japanese earthquake. Dr. Yamao introduced the concept of "social capital" as a means to strengthen the resilience of coastal communities in the face of disasters. In the following talk, Dr. Natsuki Hasegawa provided the example of an impact to a coastal community in Japan by describing tsunami damages to the Asari clam fishery of Hokkaido, and the possibilities of its recovery. In the next two presentations, the effects of the accident at the nuclear power plant following the tsunami were discussed. Dr. Richard Brodeur introduced the concept of possible radio-biologic stress in food webs on the scale of the North Pacific. Dr. Toshihiro Wada described losses of fishery facilities and interruption of availability of marine products that were experienced closer to the site of the plant in Fukushima Prefecture. In both cases monitoring of radionuclides and the environment were advanced as important considerations for understanding the disturbances studied.

The main subjects of talks in fourth part of the session were physical oceanographic monitoring and predicting the effects of the earthquake and tsunami using models. Dr. Nikolai Maximenko, an invited speaker, introduced his models for tracking marine debris across the North Pacific Ocean while Dr. John Barth described observing systems off the California, Oregon and Washington coasts and the emergency preparedness measures that have been taken in anticipation of the tsunami arising from a major Cascadia Subduction earthquake. Dr. Josef Cherniawsky, an invited speaker, described the tsunami inundation modeling that he has carried out for parts of the west coast of Vancouver Island, assuming a Cascadia event, while Dr. Xiaorong Li described his model simulations to study the impact of a possible tidal power station on the

surrounding marine environment. After the all papers had been presented, Dr. Toyomitsu Horii, one of the Co-convenors, reviewed the session briefly, and introduced related sessions on the research of the earthquake.

The subject of every poster of this session was related to the research on the effects of the Great East Japan Earthquake. During the poster session on Thursday, the presenters had enthusiastic discussions with many interested parties till the session end.

The Co-convenors and a member of the Technical Committee on Monitoring (MONITOR) judged that the best oral presentation for a MONOTOR-sponsored Topic Session by an early scientist was by Dr. Toshihiro Wada (Japan) who spoke about “*Tsunami disaster and nuclear power plant accident effects on fishery facilities and marine products in Fukushima Prefecture: present conditions and prospects*”. The best poster presentation was by Dr. Hideki Kaeriyama (Japan) on “*Oceanic dispersion of radioactive cesium around Japan and western North Pacific after the Fukushima Dai-ichi Nuclear Power Plant Accident*”. These two papers were quick reports on the effects of the nuclear power plant accident through direct research at the site of the accident with a view to international concerns.

List of papers

Oral presentations

Stanley D. Rice (Invited)

Exxon Valdez: Long term environmental consequences of oil persistence and toxicity

Hiroya Sugisaki

On behalf of Japanese Society of Fisheries Oceanography

General report on the projects aided by the PICES/ICES/JSFO fund for fisheries and oceanographic research on the recovery from the Great East Japan Earthquake

Shin-ichi Ito, Shigeo Kakehi, Taku Wagawa, Yoji Narimatsu, Yutaka Kurita, Tomoko Sakami, Hideki Takami, Hideki Kaeriyama, Ken Fujimoto, Tsuneo Ono, Hiroyuki Tanaka, Takashi Kamiyama, Shigeru Itakura, Yuji Okazaki, Kazuaki Tadokoro, Akira Kuwata, Hiroaki Saito, Masaki Ito and Tsutomu Hattori (Invited)

The application of marine research to the study the marine ecosystem on the Pacific coast of northeastern Japan after the Great East Japan Earthquake disaster

Daisuke Muraoka, Tomoko Sakami, Goro Yoshida, Masakazu Hori, Hiromori Shimabukuro, Takehisa Yamakita and Hitoshi Tamaki

Impact of the Great East Japan Earthquake on *Zostera* meadows in the coastal area close to the epicenter

Hideki Takami, Tomohiko Kawamura, Daisuke Muraoka, Nam-II Won and Hiroshi Nakaie

Effects of the mega-earthquake and tsunami on rocky shore ecosystems on Sanriku Coast, Japan

Hiroshi Isami and Atsushi Tsuda

Effects of the tsunami on zooplankton communities in Otsuchi Bay, northern Japan

Masahiro Yamao, Zulhamsyah Imran, Achmad Zamroni, Kazuko Tatsumi and Michiko Amamo (Invited)

Strengthening social resilience in earthquake and tsunami affected coastal Asia through improvement of livelihood and social capital

Natsuki Hasegawa and Toshihiro Onitsuka

Damage from the tsunami on the Asari clam fishery in east Hokkaido, Japan and the problems in its recovery

Delvan Neville, Richard D. Brodeur, A. Jason Phillips and Kathryn Higley

Assessment and characterization of radionuclide concentrations from the Fukushima Reactor release in the plankton and nekton communities of the Northern California Current

Toshihiro Wada, Yoshiharu Nemoto, Shinya Shimamura and Satoshi Igarashi

Tsunami disaster and nuclear power plant accident effects on fishery facilities and marine products in Fukushima Prefecture: Present conditions and prospects

Nikolai Maximenko and Jan Hafner (Invited)

Tracking marine debris generated by the March 11, 2011 tsunami using numerical models and observational reports

John A. Barth, Jonathan Allan, Craig Risien, Jan A. Newton and NANOOS Colleagues

The Northwest Association of Networked Ocean Observing Systems (NANOOS) interactive tsunami evacuation maps

Josef Cherniawsky and Roy Walters (Invited)

Predicting future tsunami waves and currents on the West Coast of Canada

Xiaorong Li, Huaming Yu and Songyang Song

A new method based on FVCOM to simulate the impacts of a tidal power station on the surrounding marine environment

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Poster presentations

Yuichiro Yamada, Shinnosuke Kaga and Takehiko Ogata

Influence of a huge tsunami on the coastal plankton community structure, especially on the abundance of the toxic dinoflagellate (*Alexandrium tamarense*) in Ofunato Bay, Sanriku, Japan

Yuji Okazaki, Yutaka Kurita and Shinji Uehara

Changes in the demersal fish communities of the sandy beach in Sendai Bay after the disturbance by the tsunami

Hiroyuki Tanaka, Shigeho Kakehi and Shin-ichi Ito

Temporal variation of polycyclic aromatic hydrocarbons in surface seawater from Sendai Bay, Japan, between June 2011 and March 2012

Daisuke Ambe, Hideki Kaeriyama, Yuya Shigenobu, Ken Fujimoto, Hajime Saito, Hideki Sawada, Tsuneo Ono, Takashi Setou and Tomowo Watanabe

Distribution of radioactive cesium in sea sediment and bottom boundary layer after the Fukushima Daiichi Nuclear Power Plant accident

Galina S. Borisenko, Yuriy G. Blinov and Igor I. Glebov

Investigation of radioactive pollution of biological resources in the northwest part of the Pacific Ocean after leakage at the nuclear power station “Fukushima-1” in Japan

Hideki Kaeriyama, Daisuke Ambe, Masachika Masujima, Kou Nishiuchi, Ken Fujimoto, Tsuneo Ono and Tomowo Watanabe

Oceanic dispersion of radioactive cesium around Japan and western North Pacific after the Fukushima Dai-ichi Nuclear Power Plant accident

Hiroya Sugisaki

On behalf of Japanese Society of Fisheries Oceanography

General report on the projects aided by the PICES/ICES/JSFO fund for fisheries and oceanographic research on the recovery from the Great East Japan Earthquake

BIO/FIS/POC Topic Session (S12)

Advances in understanding the North Pacific Subtropical Frontal Zone Ecosystem

Co-convenors: *Michael Seki (USA), Skip McKinnell (PICES) and Taro Ichii (Japan)*

Background

The goal of this session was to compile a comprehensive collection of papers for the first time in two decades that can serve to synthesize knowledge of the roles of climate, physics, chemistry, biology, and humans in the Subtropical Frontal Zone (STFZ). The STFZ is a large, seasonally variable, dynamic, and complex oceanic region spanning the breadth of the North Pacific Ocean from Asia to North America. Its large-scale fronts and mesoscale processes give rise to localized “hot spots” of enhanced biological aggregation. The productivity of the region provides the ecological underpinnings for multi-national commercial fisheries. The STFZ provides important habitat for many species of fish and squid, seabirds, and marine mammals that undergo extensive seasonal migrations between the STFZ and summer feeding grounds in the Subarctic. Concern for interactions between protected species, such as loggerhead turtles, and fisheries are focus areas of interest today, as is the health and productivity of the fisheries resources. Finally, interest in the effect of marine debris that is accumulating in oceanic “garbage patches” is increasing, perhaps exacerbated by growing interest in the fate of the debris field in the aftermath of the 2011 tsunami near Japan. This session sought to provide valuable information on potential impacts of climate and humans on marine ecosystem in the STFZ.

Summary of presentations

Topic Session S12 brought together a collection of speakers and presentations that advanced our understanding of the North Pacific Subtropical Frontal Zone (STFZ) ecosystem. The half-day session of 8 speakers and 2 posters brought new insights into the relationship between the physics of oceanography, atmospheric forcing, and climate and the biological and chemical patterns observed in the region. Several speakers highlighted differences observed between the higher productive pre-1998 regime and the lower productive post-1999

period and importance of the Transition Zone Chlorophyll Front (TZCF) to reproductive and foraging success. Through the presentations, we heard on research regarding aspects of ecological (e.g., food web) function and relationships among phyto- and zoo-plankton in the Kuroshio Extension and aspects of the spatial ecology and biology of key transition zone ecosystem nekton, such as neon flying squid, Pacific saury, Pacific pomfret, seabirds (albatrosses), and predatory fishes. Anthropogenic concerns (impacts of fishing, fate and distribution of marine debris) were also discussed in the context of the STFZ oceanography and regional resources. Papers contributed to this session and a number of focused invited contributions are planned to be published in a special dedicated issue of Progress in Oceanography.

List of papers

Oral presentations

Hiromichi Igarashi, Toshiyuki Awaji, Taro Ichii, Mitsuo Sakai, Yoichi Ishikawa, Shuhei Masuda, Haruka Nishikawa, Yoshihisa Hiyoshi, Yuji Sasaki and Sei-Ichi Saitoh (Invited)

Diagnosis of the possible link between interannual variation of neon flying squid abundance in the North Pacific and the recent climate regime shift in 1998/99 by using 4DVAR ocean data assimilation product

Evan A. Howell, Aimee L. Hoover, Jeffrey J. Polovina and Michael P. Seki

Spatial and temporal variability in the biophysical properties of the North Pacific Subtropical Frontal Zone during 1997-2011

Carey Morishige and Evan A. Howell

Marine debris movement and concentration within the North Pacific Ocean

Hiroaki Saito, Kazutaka Takahashi, Yuichiro Nishibe, Ken Furuya, Koji Hamasaki, Kiyotaka Hidaka, Tadafumi Ichikawa, Mutsuo Ichinomiya, Shigeho Kakehi, Miwa Nakamachi, Yuta Nishibe, Yuji Okazaki and Yuya Tada

Food-web structure and dynamics in the frontal zone of Kuroshio Extension

Mitsuo Sakai, Toshie Wakabayashi, Haruka Urabe, Makoto Okazaki, Yoshiki Kato, Masachika Masujima, Denzo Inagake and Yasuhiro Senga

Distribution and growth of young neon flying squid, *Ommastrephes bartramii*, in the central North Pacific Subtropical and Transition Zones during winter

Taro Ichii, Haruka Nishikawa, Hiromichi Igarashi, Hiroshi Okamura, Kedarnath Mahapatra, Mitsuo Sakai, Toshie Wakabayashi, Denzo Inagake and Yoshihiro Okada

Impacts of extensive squid driftnet fishery and climate variability on epipelagic nekton in the Transition Region of the central North Pacific

David G. Foley, Elliott L. Hazen, Steven J. Bograd, Scott A. Shaffer, Scott Benson, Barbara A. Block and Daniel P. Costa

Convergence from bottom to top: An oceanographic perspective on the movements of apex predators near the North Pacific transition zone chlorophyll front

Lesley H. Thorne, Scott A. Shaffer, Elliott L. Hazen, Steven J. Bograd, David G. Foley, Melinda G. Connors, Michelle A. Kappes and Daniel P. Costa

Effects of inter-annual variability of the transition zone chlorophyll front on the habitat use and reproductive success of Laysan and Black-footed albatrosses

Poster presentations

Atsushi Yamaguchi, Kohei Matsuno, Yoshiyuki Abe and Ichiro Imai

Interannual/latitudinal variations in abundance, biomass, community structure and estimated production of epipelagic mesozooplankton along 155°E longitude in the western North Pacific during spring

Dharmamony Vijai, John R. Bower, Yoshihiko Kamei and Yasunori Sakurai

Distribution and characteristics of neon flying squid (*Ommastrephes bartramii*) near a spawning area off Hawaii

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MEQ/FUTURE Topic Session (S13)

Risk management in coastal zone ecosystems around the North Pacific

Co-convenors: *Masahide Kaeriyama (Japan) and Thomas Therriault (Canada)*

Background

Currently, approximately 60% of the world's population lives within 60 km of the coast and this number is expected to reach 75% within the next two decades due to increased population growth. The coastal zone is an extremely complex environment that includes both coastal, nearshore marine and estuarine ecosystems and the adjacent terrestrial area. Human populations around the North Pacific rely heavily on this zone for their livelihood but growing pressures from increasingly diverse human activities coupled with climate change and natural catastrophes (e.g., earthquake and tsunami) threaten the sustainability and productivity of coastal ecosystems. Risk management based on adaptive management and precautionary principles, is one way to prioritize, identify, and potentially mitigate impacts resulting from diverse human activities in coastal zones. This session focused on the following issues: (1) Preparation and countermeasures to respond to natural catastrophes; (2) Protection of coastal zone ecosystems from human-mediated impacts (e.g., habitat loss, pollution, harmful algal events, invasive species); (3) Planning and use of marine protected areas (MPAs).

Summary of presentations

Session S13 was convened for a ½ day on Wednesday, October 17, 2012, and was launched with Dr. Erlend Moksness (Institute of Marine Research, Norway) providing the introductory keynote address followed by eight contributed papers on the topic, including one by an early career scientist. Late cancellations resulted in three new presentations added to this session after the program was printed, including some originally identified as posters (see changes below).

Given the complexity of coastal ecosystems and the degree to which humans depend on them for their variety of ecosystem services, a good governance structure that links science and management is imperative to ensure long term sustainability. As an example, Dr. Moksness showed how the increasing human population and shift away from poverty in some regions is driving up demand for food resources, including fisheries ones that, in turn, results in additional pressures on coastal ecosystems. To reduce conflicts and increase sustainability there is a need for integrated coastal zone management (ICZM), a process that is complementary to ecosystem-based management (EBM), and allows for spatially-based decision making with input from stakeholders/clients. Using a Norwegian example, Dr. Moksness showed how competing demands for marine coastal waters has increased from shipping and fishing being the original conflicts but over time additional demands such as oil and gas and salmon farming became major coastal activities. By developing explicit spatial maps of these activities, Norway is implementing a research initiative on area-based management that will identify no-catch zones, sensitive habitat zones, aquaculture zones, and zones with no management restrictions. The intent of this initiative is that results will be scalable to larger spatial units. This integrated approach provides a way to identify risks and develop mitigation measures.

The Seto Inland Sea of Japan is an example of a coastal ecosystem that has seen significant changes over the last half century. Dr. Ichiro Imai (Hokkaido University, Japan) showed how land reclamation activities led to eutrophication and harmful algal bloom (HAB) events in the 1960s and 70s. In addition, he showed how algicidal bacteria living on seagrass can mitigate the impacts of HAB events. In a risk context, restoration of seagrass beds could lead to increases in these bacteria that would ultimately reduce the impacts (frequency or severity) of HAB events in coastal waters.

Dr. Ellik Adler (United Nations) introduced a COBSEA project entitled Spatial Planning in the Coastal Zone – Climate Change and Disaster Risk Reduction in the East Asian Seas Region. This project was implemented in three phases. The first phase produced guidance documents for authorities to incorporate risk reduction strategies into existing policies and procedures. The goal was not to tell authorities how to change legislation

but rather to identify ways to work within existing legislation to achieve project goals. The second phase used consultations to identify capacity building and adaptation needs such that training could be tailored to meet demands. The last phase is a train-the-trainer approach to develop longer-term capacity with respect to marine spatial planning in developing countries. For this project stakeholder involvement was high, in part due to a focus on local issues and priorities with products translated and adapted for specific audiences.

High school student Ji-Yeon Shin presented a paper that analyzed awareness of ocean environment issues among two different groups in Korea: high school students and SCUBA divers. While awareness on some “popular” topics was high among students it was low on others. However, this group was very willing to engage on the topic, and increased awareness of marine environmental issues might increase activity. Although SCUBA divers tended to be more aware of environmental issues, even they lacked awareness on emerging topics such as barren grounds. Like high school students, this active group was willing to engage on marine environmental issues once they were identified. Ms. Shin suggested that awareness for both groups could be raised simply by employing social media networks.

Dr. Tomohiko Kawamura (University of Tokyo, Japan) introduced a new long-term project to monitor recovery of coastal environments following the Great East Japan Earthquake and Tsunami for sustainable future fisheries. Although kelp beds and algae appeared undamaged following the tsunami, urchins were removed from these habitats which could suggest longer-term impacts. Further, increased sedimentation following land subsidence is an emerging issue. With a reduction in the number of grazers in the system, an increase in macroalgae was observed which had positive impacts on adult urchin and abalone populations but negatively impacted juvenile populations due to a loss of corral crystalline algae habitat needed for larval settlement and early life history development. Increased monitoring of coastal environments will provide data necessary to manage fisheries in this area in a sustainable way and thereby mitigate the risk of longer-term impacts.

Mr. Tomoya Kataoka (National Institute for Land and Infrastructure Management, Japan) provided an overview of a project to identify transport processes of marine debris, especially plastics, using a webcam monitoring program. Color references were developed to separate plastics from natural debris (*e.g.*, wood) and by using the field of view of the webcam it was possible to calculate the coverage of plastic debris on each of the monitored beaches. To show this approach is responsive to actual changes, he showed that following planned beach cleanup events, the amount of plastics confirmed by webcam decreased. Although wind and other factors can affect the actual distribution of marine debris on beaches, this webcam approach is a cost effective method to monitor a number of beaches without having to constantly sample them.

Dr. Sei-Ichi Saito (Hokkaido University, Japan) introduced the development and application of Tohoku Coastal Web-GIS for supporting recoveries of the Tohoku Earthquake. The Tohoku Coastal Web-GIS, containing satellite information with high resolution GeoEye images, is applied for services and contributions to support activities of recoveries from the Tohoku Earthquake and Tsunami. This system will be useful for on-going Web-GIS in support of risk management and recoveries.

Dr. Paul Harrison (University of British Columbia, Canada) discussed the relationship between N:P ratios and the occurrence of red tide events and highlighted how these ratios can be misleading from a risk management perspective. If the actual concentration of either N or P (or Si) is not limiting for diatom/dinoflagellate growth, then regardless of the ratio, red tide events should be expected. Conversely, even if the N:P ratio suggests red tides might be expected, if the actual concentrations are limiting, then red tide organisms will not have the resources required to bloom. He used a sewage treatment diversion in Hong Kong as an example of how these N:P ratios can be misleading and showed how other variables such as hydrodynamics, wind, typhoon events, *etc.* can affect the stratification of coastal waters making them more (or less) susceptible to red tide events.

The last contributed oral presentation was given by Dr. Masahide Kaeriyama (Hokkaido University, Japan) who talked about the need for an adaptive management strategy to create sustainable chum salmon fisheries in Japan. Climate change is affecting the carrying capacity of the North Pacific and is resulting in distributional

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changes in many species, including salmon. By considering factors such as regime shifts, climate change impacts, distribution and carry capacity changes, managers potentially can mitigate longer-term sustainability impacts by pro-actively reducing harvest in expected poor return years and increasing it when conditions are favorable. A similar adaptive management strategy would apply to fisheries impacted by the Great East Japan Earthquake and Tsunami.

Overall, this session on risk management provided an overview of how integrated/adaptive management can be used to identify and mitigate impacts in coastal zones. Given the wide variety of human activities in coastal zones and the growing list of potential threats/impacts, having a management strategy that is risk-based, transparent, and understood by managers, clients, and stakeholders alike is essential to ensuring sustainable coastal systems. In addition to specific frameworks and examples, this session also identified potential tools that could be used for adaptive management, including webcams and GIS-based applications. Japan is using adaptive management to mitigate impacts from the Great East Japan Earthquake and Tsunami as highlighted in some oral presentations in this session; reconfirming risk-based management approaches are broadly applicable for ensuring long term sustainability in coastal zones.

List of papers

Oral presentations

Erlend Moksness (Invited)

Coastal marine ecosystems and Integrated Coastal Zone Management (ICZM): A way forward

Ichiro Imai, Asami Kuroda, Yuka Onishi, Atsushi Yamaguchi and Mineo Yamaguchi

History of eutrophication and harmful algal bloom (HAB) events in the Seto Inland Sea of Japan and a proposal for prevention strategies for HABs using seaweed- and seagrass-beds

Ellik Adler, Lawrence Hildebrand and Reynaldo Molina

Coastal Spatial Planning in the East Asian Seas Region – Climate Change and Disaster Risk Reduction

Ji-Yeon Shin

Analysis of urban high school students' and scuba divers' awareness on the ocean environment and plans to enhance public awareness

Tomohiko Kawamura

Secondary succession in coastal ecosystems after the enormous disturbance by the Great East Japan Earthquake on the Sanriku Coast: Importance of scientific guidelines for future sustainable fisheries and ecosystem management

Tomoya Kataoka, Hirofumi Hinata and Shin'ichiro Kako

Simultaneous monitoring at multiple sites of beached plastic litter quantity using webcam

Sei-Ichi Saitoh, Katsuyoshi Tanaka and Fumihiro Takahashi

Development and application of Tohoku Coastal Web-GIS for supporting recoveries of the Tohoku Earthquake

Paul J. Harrison, Jie Xu and Kedong Yin

Do changes in N:P ratios influence the occurrence of HABs?

Masahide Kaeriyama, Yu-xue Qin, Yosuke Koshino, Daisuke Uryu and Hideaki Kudo

Sustainability and risk management of Pacific salmon under changing climate and catastrophic earthquake and tsunami in coastal ecosystems around Japan

Poster presentations

Galina S. Gavrilova

Some risks of on-bottom shellfish aquaculture in Peter the Great Bay (Japan Sea)

POC/TCODE Topic Session (S14)***Changing ocean biogeochemistry and its ecosystem impacts***

Co-sponsored by: *ICES, IMBER and SOLAS*

Co-convenors: Silvana Birchenough (ICES/UK), Steven Bograd (PICES/USA), Arthur Chen (IGBP), Masao Ishii (PICES/Japan) and Tony Koslow (PICES/USA)

Background

Ocean biogeochemistry is undergoing rapid and growing anthropogenic change. A significant fraction of anthropogenic CO₂ is taken up by the ocean, which drives down pH and reduces the saturation state of carbonate minerals like calcite and aragonite, a process known as “ocean acidification”. Global climate models also predict that dissolved oxygen concentrations in the deep ocean will decline by 20–40% over the coming century or so as global warming enhances stratification of the upper mixed layer and reduces ventilation of the deep ocean. Declining oxygen levels have now been reported from mid-ocean depths in the tropical oceans and across the North Pacific. Both processes are of particular concern in the North Pacific, where the water is naturally “old” and has shallow carbonate saturation horizons, relatively low buffering capacity, and extensive oxygen minimum zones. It is anticipated that these anthropogenic influences on the global ocean will increase in coming decades as atmospheric CO₂ levels and global temperatures continue to rise. Papers were invited on the changing biogeochemistry of the global ocean, its impacts on organisms and ecosystem function, and emergent impacts on biogeochemical cycles related to the interaction of ocean acidification and declining oxygen with climate change and other anthropogenic impacts.

Summary of presentations

Session S14 was held on Tuesday, October 16, 2012 (full day), and was launched with an invited talk by Dr. Akihiko Murata (JAMSTEC, Japan) and included two other invited presentations: Brad Seibel (URI, USA) and Curtis Deutsch (UCLA, USA). In addition, there were 14 contributed oral presentations and five posters.

The lead invited address was given by Dr. Murata who reviewed decadal changes in dissolved inorganic carbon (DIC), reflecting uptake of anthropogenic CO₂ across the North and South Pacific based on repeat hydrographic sections. The pattern was surprisingly variable, with low inventory in the Equatorial Pacific and high in the subtropical gyres. In deeper waters, high CO₂ was found in mode waters but deeper, only in Antarctic Intermediate Water; not so much in North Pacific Intermediate Water. Overall ~40% of the oceanic uptake of CO₂ is found in the Pacific Ocean from 50°S–65°N. Distribution processes have not changed significantly over the past decade.

Dr. Liqi Chen from the Key Lab of Global Change and Marine-Atmospheric Chemistry (China) followed on by examining changes in surface *p*CO_s in the western Arctic Ocean, in particular the implications of shrinking sea-ice extent. The paper was based on five Chinese Arctic cruises from 1999–2010. Over this period, the expeditions progressively reached further north due to the shrinking sea ice. Very low *p*CO₂ is found under the sea ice but high values, almost as high as in the air, are found in exposed surface waters due to uptake from the atmosphere. This could accelerate the negative impact of ocean acidification in Arctic ecosystems. A mixing model was developed for CO₂ in the western Arctic based on exchanges with the Bering Sea. Surface acidification was caused by both biological recycling and uptake of atmospheric CO₂. The increased uptake by the Arctic may provide a negative feedback to the buildup of CO₂ in the atmosphere.

The next paper by Drs. Takamitsu Ito (Georgia Institute of Technology) and Curtis Deutsch (University of California, LA) was delivered by Deutsch due to the early departure of Ito. The paper examined decadal-scale trends in the expansion and contraction of the oxygen minimum zone (OMZ) in relation to changing respiration. Using time series from the Eastern Tropical Pacific (ETP) from 1960–2000, recent work by Stramma *et al.* showed expansion of the OMZ in the last 20 years. Ito and Deutsch used CalCOFI data to

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develop a global ocean biogeochemical model, which focused on the ETP. The model showed contraction of the OMZ in the 1970s but expansion in the recent past. The volume of suboxic water varied considerably with multidecadal variability and the influence of major El Niños. The apparent oxygen utilization (AOU) is the major contributor to the pattern. Transport was dominated by the Equatorial Undercurrent. Respiration shows a positive trend highly correlated with warming and dominates. The model indicates there are two competing effects. El Niño leads to not only weaker transport of low O₂ water, but also less upwelling and hence less productivity. But the overall effect is increased O₂ due to decreased upwelling. La Niña, however, leads to OMZ expansion. The thermocline water has a kind of memory that integrates the ENSO signals to a PDO, or multidecadal signal.

The next paper presented by Dr. Shuchai Gan (East China Normal University, China) examined patterns of bio-available dissolved organic carbon (BDOC) of different water masses in the East China Sea. DOC comprises the largest carbon pool in the ocean: 1% is equivalent to 1 year's fossil fuel combustion. Micro-organisms are major consumers of DOC. But much is refractory and this portion of the carbon cycle is poorly understood. There are several water masses in the East China Sea, including coastal and oceanic water and water with Yangtze River influence. As Dr. Gan and co-author, Dr. Ying Wu, showed, each water mass may have a distinct chemistry with different labile and non-labile components with different bioavailability.

Dr. Kosei Komatsu (University of Tokyo) and colleagues used historical observations and survey data to investigate nutrient transport within the Kuroshio Current and its impacts on regional productivity. They found maximum nutrient concentrations within the Kuroshio jet at levels between 24.5–26.0σ_q with a structure similar to that seen in the Gulf Stream. Evidence of high epipycnal and diapycnal fluxes were observed, the latter contributing significantly to spring new production in adjacent regions.

Dr. Jim Christian (Fisheries and Oceans Canada) and colleagues compared patterns and trends in ocean calcite and aragonite saturation states from a suite of CMIP5 Earth System Models. Each of the 7 models compared demonstrated strengths and weaknesses when compared to observations, emphasizing the need to use multiple models. They found an order of magnitude increase by 2100 in total area of shallow aragonite saturation in all models under the “no mitigation” scenario, although this depended strongly on the rate of CO₂ increase. All models underestimated the North Pacific contribution to the growth of the area of shallow undersaturation.

Dr. Silvana Birchenough (Lowestoft, UK) and colleagues showed how a sediment profile imagery camera could be used to characterize benthic communities and their sedimentary characteristics in areas adjoining cold-water coral reefs, which are subject to potential stress due to ocean acidification. They demonstrated the use of the camera system based on a cruise to the Outer Hebrides and Banana reef complex and the Logachev Mounds in the northeast Atlantic. Distinct benthic communities and sediments were found at each site, and the work showed the potential of the camera system to explore these habitats and develop time series to assess the potential impacts of acidification on a diverse deepwater habitat.

Dr. Jack Barth (Oregon State University, USA) and colleagues described patterns of hypoxia on the Oregon continental shelf from a suite of instruments including buoys, moorings, gliders, and ship-based surveys, as well as historical hydrographic observations. They described significant interannual variability in the timing, intensity and spatial distribution of hypoxia on the inner shelf, including the appearance of anoxia in summer 2006. A simple model driven by local wind forcing and source water dissolved oxygen levels explains 80% of the variability in near-bottom, inner shelf dissolved oxygen. Based on projected changes in source water dissolved oxygen, they estimated that the frequency of inner shelf hypoxia during the summer upwelling season could increase to 90%, comparable to the persistent hypoxic conditions found in the Humboldt Current.

Dr. Yvette Spitz (Oregon State University, USA) presented a paper by herself and Dr. Harold Batchelder based on a coupled ecosystem-ROMS modeling approach to investigating dissolved oxygen dynamics on the Oregon continental shelf and cross-shelf exchanges. They presented a model hindcast for three years (2002, 2006, and 2008) that had different forcing and displayed different patterns of hypoxia. The model reproduced

the observed interannual variability quite well, but they found that their results were highly sensitive to initial and boundary conditions.

Dr. Curtis Deutsch (University of California, LA) presented an invited talk, co-authored with Dr. Aaron Ferrel, on organisms' metabolic constraints related to oxygen requirements and the potential impacts of climate change. They presented a metabolic index based on the ratio of O₂ supply and demand. They compiled laboratory studies for a range of organisms to show that despite a wide range of thermal and hypoxic tolerances, the contemporary range of the investigated species was bounded by a similar metabolic index. Changing climate will thus impose a fundamental metabolic constraint on their habitat. Marine organisms (unlike terrestrial organisms) are generally metabolically constrained at the equatorial edge of their range. Habitats will generally shrink in the future with warmer and deoxygenated water.

Dr. Brad Seibel (University of Rhode Island, USA) changed the title of his invited talk to "*Existing oxygen levels are the critical oxygen levels*". He presented a range of field and laboratory studies identifying the critical oxygen levels for marine animals that depend on temperature and other environmental factors. He showed the adaptations of mesopelagic organisms to low oxygen concentrations but showed that many of those organisms were already living at the limits of their oxygen and temperature tolerances. Thus future potential changes due to warming, acidification, and deoxygenation could have dramatic impacts on midwater communities.

Drs. Angelica Peña and William Crawford (Fisheries and Oceans Canada) showed the long-term trend of dissolved oxygen in the ocean interior off the west coast of Canada. Dr. Peña examined oxygen time series on the shelf as well as at OS Papa. She demonstrated that the decadal pattern on the shelf matched that observed in the southern California Current with dissolved oxygen level low around 1960, increasing in the mid-1980s, and decreasing significantly in the last decade. The pattern in the open waters of the Gulf of Alaska shows a different pattern, exhibiting a monotonic decline.

Dr. Yukihiro Nojiri (National Institute for Environmental Studies, Japan) and colleagues presented a paper on the variability of the carbon cycle and biological production in the North Pacific estimated from mapping *p*CO₂, alkalinity, and dissolved inorganic carbon. Observations of ocean surface *p*CO₂ were collected as part of the NIES programme. The presentation showed a climatology map including DIC values, demonstrating a decrease in concentration during the summer season, mainly related to the community productivity at the ocean surface. DIC changes were observed in some areas. The main conclusions were that: i) DIC distribution has higher spatial variation and can be analyzed with neural networks, including *p*CO₂ mapping and ii) the maps could be compared against the oceanic variability such as ENSO and/or PDO to estimate the influence of these oceanic patterns on biological production to understand the impact of PDO on the changing DIC distribution.

Dr. Keith Rodgers (Princeton University, USA) and colleagues discussed the re-emergence of anthropogenic carbon and Pacific pool acidification. They presented a model to test the hypothesis that meridian overturning of the Pacific subtropical cell controls the supply of anthropogenic DIC to the Pacific warm pool. The model results agreed well with the results presented by Ishii (2009). The upwelling of thermocline waters rich in anthropogenic carbon in the cold tongue regions serves as a "re-emergence" of anthropogenic carbon. Some of this work suggests that re-emergence is a first order, if not dominant, driver of the acidification of equatorial Pacific warm pool waters.

Dr. Finlay Scott (Lowestoft, UK) and colleagues prepared a paper on predicting the regional impacts of ocean acidification based on integrating sediment biodiversity and ecosystem function. The effects of ocean acidification for benthic species were developed in a model to examine faunal responses. A Biological Traits approach (BTA) was used to code the species based on their sensitivity. The North Sea benthos 1986 survey was used since biomass and abundance were available and the data were used to calculate a Bioturbation Potential index. The use of Chl and organic carbon to characterize the areas was also examined in relation to

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the index values. A series of histograms were used to examine changes by area and to explore the importance of sensitive species in those areas. The work is still under development.

Dr. Tony Koslow (Scripps Institution of Oceanography, USA) and colleagues presented a talk on the influence of declining oxygen concentration on mesopelagic fish biomass in the California Current and the potential impacts on ecosystems structure. CalCOFI ichthyoplankton and environmental data were used to show a close relationship between decadal changes in midwater oxygen concentration and the abundance of a wide range of mesopelagic fishes in the California current. Changes in the mesopelagic fishes were correlated as well with large-scale environmental indices, such as the ENSO and PDO on the one hand and with fluctuations of dominant epipelagic planktivores (anchovy, hake, and mackerel) on the other. The abundance of both mesopelagic migrators and total meso- and epipelagic planktivores were negatively correlated with the abundance of key plankton groups. However, the correlation seemed to be mediated by common correlations with environmental forcing, such as the strength of the California Current.

Dr. Julie Keister (University of Washington, USA) and colleagues talked about the oxygen and pH conditions experienced by zooplankton in Puget Sound. Field and laboratory results were combined to study the relationship between ocean chemistry and zooplankton distribution, focusing primarily on areas with particularly extreme oxygen and acidification conditions. Experiments examined the influence of hypoxia on developmental rate, hatching success and mortality. This information has the potential to be used to model the future for coastal ocean ecosystems under conditions of increasing oxygen and acidification stress.

List of papers

Oral presentations

Akihiko Murata, Shinya Kouketsu, Toshimasa Doi, Kazuhiko Hayashi and Yuichiro Kumamoto (Invited)

Decadal changes of dissolved inorganic carbon in the Pacific

Liqi Chen, Zhongyong Gao, Wweijun Cai, Heng Sun and Suqing Xu

Surface Carbon Changes in the western Arctic Ocean under sea ice rapid shrinking and its implication of Arctic Ocean acidification

Takamitsu Ito and Curtis Deutsch

Understanding low-frequency variability of subsurface oxygen using a hierarchy of models

Shuchai Gan and Ying Wu

Quantification of BDOC (bio-available dissolved organic carbon) of different water masses in East China Sea

Kosei Komatsu, Ichiro Yasuda, Sachihiko Itoh, Toru Ikeya, Hitoshi Kaneko, Kiyotaka Hidaka and Satoshi Osafune

Impacts of epipelagic and diapycnal nutrient-transport by the Kuroshio on the productivity in the adjacent epipelagic waters

James Christian, Laurent Bopp, John Dunne, Michael Eby, Paul Halloran, Tatiana Ilyina, Ian Totterdell and Akitomo Yamamoto

Trends in ocean CaCO₃ undersaturation in the CMIP5 suite of Earth System Models

Silvana N.R. Birchenough, Nigel Lyman, David A. Roberts, Juan Moreno-Navas and J. Murray Roberts

In-situ characterisation of habitats adjoining cold-water coral reefs using a Sediment Profile Imagery (SPI) camera

John A. Barth, Francis Chan and Stephen D. Pierce

Understanding and predicting hypoxia over the Pacific Northwest continental shelf

Yvette H. Spitz and Harold P. Batchelder

Oregon shelf oxygen dynamics and exchange with the deep ocean: A modeling approach

Curtis Deutsch and Aaron Ferrel (Invited)

Metabolic constraints on marine habitat and its climatic change

Brad A. Seibel (Invited)

Existing oxygen levels are the critical oxygen levels

Angelica Peña and William Crawford

Trends in oxygen concentrations in the Gulf of Alaska and British Columbia waters

Yukihiro Nojiri, Sayaka Yasunaka, Shinichiro Nakaoka, Tsuneo Ono, Hitoshi Mukai and Norihisa Usui

Variability of carbon cycle and biological production in the North Pacific estimated from mapping of *p*CO₂, alkalinity, and dissolved inorganic carbon

Keith B. Rodgers, Masao Ishii, Daniele Iudicone, and Olivier Aumont, Matthew C. Long and Joan A. Kleypas

Re-emergence of anthropogenic carbon and pacific warm pool acidification

Finlay Scott, Ruth Parker and Silvana N.R. Birchenough

Predicting the regional impacts of ocean acidification: Integrating sediment biodiversity and ecosystem function

J. Anthony Koslow, Peter Davison and Ana Lara-Lopez

The influence of declining oxygen concentrations and mesopelagic fish biomass on ecosystem structure in the California Current

Julie E. Keister, Anna McLaskey, Lisa Raatikainen, Shallin Busch, Amanda Winans and Paul McElhany

Oxygen and pH conditions experienced by zooplankton in a North Pacific fjord: Impacts on taxonomic composition, distributions, and growth

Poster presentations

Toshiya Nakano, Takashi Midorikawa, Tomoyuki Kitamura, Yusuke Takatani, Kazutaka Enyo, Masao Ishii and Hisayuki Y. Inoue

Recent slowdown of wintertime oceanic pCO_2 increase in the western North Pacific: Relationship to variation in the subtropical gyre

Yusuke Takatani, Daisuke Sasano, Toshiya Nakano, Takashi Midorikawa and Masao Ishii

Decrease of dissolved oxygen due to warming and other factors in the western North Pacific subtropical gyre

Naohiro Kosugi, Daisuke Sasano, Masao Ishii, Kazutaka Enyo, Toshiya Nakano and Takashi Midorikawa

Acidification in the North Pacific subtropical mode water and its relation with climate variability

Sébastien Putzeys, Carlos Almeida, Pierrick Bécognée, Lidia Yebra, Ángeles Marrero Diaz and Santiago Hernández-León

Active carbon flux by diel migrant zooplankton in the eutrophic and oligotrophic waters of the Canary Current

Toru Suzuki, Masao Ishii, Tsuneo Ono, Takeshi Kawano, Masahide Wakita, Lisa A. Miller, Akihiko Murata, Ken-ichi Sasaki, James Christian and Robert M. Key

PACIFICA: Pacific Ocean Interior Carbon Data Synthesis

BIO Paper Session

Co-Conveners: *Michael Dagg (USA), Hiroaki Saito (Japan) and Atsushi Tsuda (Japan)*

Background

The Biological Oceanography Committee (BIO) has a wide range of interests spanning from molecular to global scales. BIO targets all organisms living in the marine environment including bacteria, phytoplankton, zooplankton, micronekton, benthos and marine birds and mammals. In this session, we welcomed all papers on biological aspects of marine science in the PICES region. Contributions from the early career scientists were especially encouraged.

Summary of presentations

The BIO Paper Session at PICES-2012 had high participation, with a total of 18 oral presentations and 31 poster presentations. Oral sessions were divided over two days and were well attended. This session was very popular this year. Oral presentations spanned a wide range of biological issues focusing around microbes (1), phytoplankton (1), zooplankton (7), jellyfish (2), micronekton (1), benthos (1), marine birds and mammals (3), and other issues (2). Similarly, poster presentations covered a broad spectrum of biological topics. The convenors recognized that this regular session provides important opportunities for PICES scientists to present their results and for early career scientists to participate in PICES activities.

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List of papers

Oral presentations

John R. Bower, Katsunori Seki, Tsunemi Kubodera, Jun Yamamoto and Takahiro Nobetsu

Egg brooding in a gonatid squid off the Shiretoko Peninsula, Hokkaido, Japan

Oh Youn Kwon, Jung-Hoon Kang, Kyun-Woo Lee, Woong-Seo Kim and Jin Hwan Lee

Size-fractionated phytoplankton biomass and species composition in the Yellow Sea: A comparison of different latitudes in spring and summer

Hidefumi Fujioka, Atsushi Tsuda and Ryuji J. Machida

Early life cycle of *Neocalanus plumchrus* and *Neocalanus flemingeri* in the Oyashio region, western north Pacific

Yuichiro Nishibe, Kazutaka Takahashi, Tadafumi Ichikawa, Kiyotaka Hidaka, Hiroaki Kurogi, Kyohei Segawa and Hiroaki Saito

Feeding of oncaeid copepods on discarded appendicularian houses

Minkyung Shin, Wongyu Park and Jungwha Choi

Population dynamics of *Oithona similis* off Busan, South Korea

C. Tracy Shaw, Leah R. Feinberg and William T. Peterson

Effects of environmental changes on the euphausiids *Euphausia pacifica* and *Thysanoessa spinifera* in the coastal upwelling zone off the Oregon Coast, USA

Rui Saito, Atsushi Yamaguchi, Hiromichi Ueno, Hiroji Onishi and Ichiro Imai

Interannual variations in the zooplankton community in the Alaskan Stream region during the summer of 2004-2010

Akash R. Sastri, John Nelson and Beatrix E. Beisner

Spatial patterns of zooplankton community productivity and functional trait diversity in the Bering and Chukchi Seas

Jarrod A. Santora, John C. Field, Isaac D. Schroeder, Keith Sakuma, Brian K. Wells and William J. Sydeman

Spatial ecology of krill, micronekton and top predators in the central California Current: implications for defining ecologically important areas

Vjacheslav S. Labay

Long-term variability of sublittoral macrobenthos of the Sakhalin's shelf of Tatar Strait (Sea of Japan)

Harold P. Batchelder

Spatial-temporal patterns of residence-time, transport and connectivity among near-shore marine reserves on the Oregon shelf from particle-tracking using inputs from multiple physical models

Yongjiu Xu, Joji Ishizaka and Hisashi Yamaguchi

Interannual variation of jellyfish (*Nemopilema nomurai*) abundance and magnitude, and timing of phytoplankton bloom in the Yellow and East China Seas

Koji Hamasaki, Akiko Tomaru, Akito Taniguchi, Yuya Tada, Yasuyuki Nogata and Haruto Ishii

Microbial control of jellyfish larval settlement

Tabitha C.Y. Hui, Yumi Kobayashi, Yoko Mitani, Kei Fujii, Kei Hayashi and Kazushi Miyashita

Spatial, temporal and dietary overlap between harbour seals and fisheries in Erimo, Japan: Conflict at sea?

George L. Hunt, Jr., Martin Renner and Kathy Kuletz

The composition and distribution of seabird communities across the southeastern Bering Sea shelf

Robert M. Suryan and Amanda J. Gladics

Effects of environmental variation on diets and stable isotope signatures of a piscivorous seabird in a coastal upwelling system

Andrew W. Trites, Elizabeth Atwood, Christopher Barger, Brian Battaile, Kelly J. Benoit-Bird, Ine Dorresteijn, Scott Heppell, Brian Hoover, David Irons, Nathan Jones, Alexander Kitaysky, Kathy Kuletz, Chad Nordstrom, Rosana Paredes, Heather Renner, Daniel Roby and Rebecca Young

Is it food? A comparative analysis of increasing and decreasing populations of thick-billed murres, black-legged kittiwakes and northern fur seals in the eastern Bering Sea

Peter A. Thompson, Anya Waite and Lynnath Beckley

Investigating the recruitment failure of Australia's western rock lobster (*Panulirus cygnus*)

Poster presentations

Yuji Tomaru and Yoshitake Takao

Diversities of diatom viruses isolated from Japanese coastal waters

Anastasia S. Dolganova

Far eastern seas benthos and its investigation in TINRO-Centre (2002-2012)

Toru Kobari, Minoru Kitamura and Makio C. Honda

Seasonal changes in abundance, stage composition and depth distribution of *Neocalanus* copepods in the Western Subarctic Gyre

Chiyuki Sassa and Yuichi Hirota

Seasonal occurrence of mesopelagic fish larvae in the onshore side of the Kuroshio off southern Japan

Young-Ok Kim, Seung Won Jung and Eun-Sun Lee

Effects of oil pollution on attached microbial communities in short-term indoor microcosms

Seung Won Jung, Young-Ok Kim, Jung-Hoon Kang, Moonkoo Kim and Won Joon Shim

Impact of dispersant plus crude oil on natural plankton assemblages in short-term marine mesocosms

Kyun-Woo Lee, Chang Kyu Joo, Jung-Hoon Kang, Oh-Yoon Kwon and Won Joon Shim

Acute and chronic toxicity of the water accommodated fraction (WAF) and chemically enhanced WAF (CEWAF) of crude oil in the rock pool copepod *Tigriopus japonicus*

Elena Dulepova and Vladimir Dulepov

Carrying capacity of the Okhotsk Sea pelagic ecosystem

Ludmila S. Belan, Tatyana Belan, Boris Borisov, Alexander Moshchenko and Tatyana Konovalova

Distribution of macrozoobenthos along the pipeline route at the Lunskoye field (NE Sakhalin Island Shelf)

Seung Ho Baek, Moon Ho Shon and Won Joon Shim

Effects of the chemically-enhanced water-accommodated fraction of Iranian Heavy Crude oil on the periphytic microbial communities in microcosm experiments

Vladimir P. Korchagin, Olga Grunina, Alexander Dubov and Olga N. Vakulenko

Bioconversion of algae biomass into bioethanol using homogenate from marine invertebrate digestive organs

Rie Nakamura, Toru Kobari, Kazuyuki Tanabe, Minoru Kitamura and Makio C. Honda

Comparison of seasonal changes in the mesozooplankton community between the subtropical and subarctic North Pacific Ocean

Liudmila Dolmatova and Olga Zaika

Temporal variations in activities of antioxidant enzymes in coelomic fluid of the holothurian *Eupentacta fraudatrix* in Alexeev Bay (Peter the Great Bay), Sea of Japan

Kiyotaka Hidaka, Takumi Nonomura, Kosei Komatsu, Sachihiko Itoh, Ichiro Yasuda, Toru Ikeya and Shingo Kimura

Distribution of calanoid copepods of the genus *Paracalanus* around the Izu Ridge, south of Japan, and extent of the 'island mass effect' in the region

Hirotsada Moki, Akira Okuno and Tatsuro Watanabe

Development of a new ocean carbon cycle model for the Japan Sea

Corinne Pomerleau, Francis Juanes, Rodney Rountree and Kate Moran

A comparative study of sound production in two marine environments monitored by the NEPTUNE Canada undersea observatory network

Kate Moran, S. Kim Juniper and Corinne Pomerleau

The Two Ocean Networks Canada (ONC) undersea observatory networks: NEPTUNE Canada and VENUS

William J. Sydeman, Jarrod A. Santora, Jason Hassrick, Marcel Losekoot, Sean Hayes and William T. Peterson

Canyonlands: Krill "hotspots" of the northern California Current

Naoya Kanna, Koji Suzuki, Aiko Murayama and Jun Nishioka

Bioavailability of sea ice-derived iron for phytoplankton growth

Natsuko Nakayama, Shinichi Kondo, Reiko Nakao, Yasuhiro Shima, Naotsugu Hata, Yuji Tomaru, Masami Hamaguchi, Keizo Nagasaki and Shigeru Itakura

Contribution of HcRNAV viruses against *Heterocapsa circularisquama* bloom by inoculating frozen sediment

Sayaka Sogawa (nee Matsumura), Hiroya Sugisaki and Tomohiko Kikuchi

Carbon and nitrogen isotope ratios of euphausiids in the northwestern Pacific

Yoshiyuki Abe, Masafumi Natsuike, Kohei Matsuno, Atsushi Yamaguchi and Ichiro Imai

Variability in assimilation efficiency of the copepod *Neocalanus cristatus*: Effect of food

John R. Bower, Yusuke Okude, Tetsuya Nishikawa and Kazutaka Miyahara

Movement of diamond squid in the Sea of Japan revealed using pop-up satellite tags

Shinji Shimode, Kazutaka Takahashi and Atsushi Tsuda

Ontogenetic vertical migration of two tropical-subtropical copepods, *Rhincalanus nasutus* and *Rhincalanus rostrifrons*, in the northwestern Pacific Ocean: Implication for a variety of life history strategies of *Rhincalanus*

Toru Kobari, Keisuke Unno, Haruka Nagafuku, Hajime Kawakami, Minoru Kitamura and Makio C. Honda

Comparisons of fecal pellet characteristics in the surface layers between the subarctic and subtropical North Pacific Ocean

Hironori Higashi, Hiroshi Koshikawa, Wang Qinxue, Motoyuki Mizuochi, Toru Hasegawa, Yoko Kiyomoto, Kou Nishiuchi, Kazumaro Okamura, Hiroaki Sasaki, Yasushi Gomi, Hideki Akiyama, Kunio Kohata and Shogo Murakami

A numerical study on predominance of dinoflagellates on the central continental shelf of the East China Sea

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Yuri V. Prikhodko, Vasiliy Yu. Tsygankov and Margarita D. Boyarova

Pesticides and seafood safety in the Russian fish market

Wang Lijun

Introduced marine species and their impacts in China seas

Konstantin A. Karyakin, Alexander A. Nikitin and Oleg N. Katugin

Distribution Patterns of the Common Squid (*Todarodes pacificus*) in the Russian EEZ in 2009-2011

Shinichi Watanabe, Satoshi Morinobu and Norimichi Souji

Daily and seasonal activity patterns of horseshoe crabs in the Kasaoka Bay estuary, Seto-Inland Sea, Japan

FIS Paper Session

Co-convenors: *Elizabeth Logerwell (USA) and Xianshi Jin (China)*

Background

This session invited papers addressing general topics in fishery science and fisheries oceanography in the North Pacific and its marginal seas, except those covered by Topic Sessions sponsored by the Fishery Science Committee (FIS).

Summary of presentations

The session consisted of 13 oral presentations and 15 posters that covered a wide variety of species and topics from all six PICES member countries. Oral presentations were given during the morning and afternoon of October 18. In the morning were two talks on the Japanese squid fishery, one on fishery income fluctuation due to changing vessel speed and one on spatial modeling of potential fishing zones. There was also a talk on comparison of fish community and trophic structure from three Japanese marine ecosystems, the Tsushima, Kuroshio and Oyashio. A talk on the role of oceanographic features (Lagrangian coherent structures) for detecting Pacific saury fishing grounds was also presented in the morning. After the morning coffee break there were two talks on cartilaginous fishes of the North Pacific, the spotted ratfish and the spiny dogfish. The spiny dogfish talk was on demographic and risk analysis and the spotted ratfish presentation was on age, growth and maturity estimates. Following these two talks were two presentations on Bering Sea fisheries. The first was on using acoustic data collected opportunistically from fishing vessels to estimate location and scale-specific fishing exploitation rates of walleye pollock. The second was on climate change and fisher behavior in the walleye pollock trawl and Pacific cod longline fisheries. The last talk of the morning was a broad-scale presentation on understanding pelagic ecosystem dynamics in the central North Pacific from a size-based perspective. In the afternoon a talk on the growth and survival of juvenile Japanese anchovy in the Kuroshio-Oyashio transitional regions was given. There was also a presentation on interannual variability in large-scale hydrometeorological processes and the potential impact on the migration routes of herring and blue whiting in the Atlantic Ocean and walleye pollock in the Pacific Ocean. Another talk was given on the relationship between habitat conditions and distribution, growth and mortality of jack mackerel in the southern East China Sea. The session concluded with a presentation on a simulation modeling study of the changes in fish phenotypic traits induced by trawl selectivity. The poster session covered a broad range of fishery science topics including population structure, reproductive biology, life history dynamics, juvenile dispersal, spatio-temporal distribution patterns, stable isotopes, oceanographic characteristics of fishing grounds, community structure, ecosystem-based assessment, impacts of underwater vessel noise, and fishery conservation status.

List of papers

Oral presentations

Yongjun Tian, Kazuhisa Uchikawa and Yuji Ueda

A comparison of fish community and trophic structure from three marine ecosystems around Japan: Synchronies, differences and environmental forcing

Osamu Tamaru, Kazushi Miyashita, Nobuo Kimura, Yasuzumi Fujimori, Toshihiro Watanabe, Hideo Takahara and Teisuke Miura

Fishery income fluctuation due to changing vessel speed from harbor to the fishing ground in the Japanese coastal squid jigging fishery

Xun Zhang, Sei-Ichi Saitoh and Toru Hirawake

Spatial modeling of the potential fishing zone of Japanese common squid in coastal waters of southwestern Hokkaido, Japan

Sergey V. Prants, M.V. Budyansky and M.Yu. Uleysky

Lagrangian coherent structures in the ocean favourable for fishing grounds

Cindy A. Tribuzio and Gordon H. Kruse

Demographic and risk analyses of spiny dogfish in the Gulf of Alaska

Jacquelynn R. King and Romney P. McPhie

Age, growth and maturity estimates of spotted ratfish (*Hydrolagus colliei*) in British Columbia

Alan C. Havnie and Lisa Pfeiffer

Climate change and fisher behavior in the Bering Sea pollock trawl and Pacific cod longline fisheries

Jeffrey Polovina and Phoebe Woodworth-Jefcoats

Understanding ecosystem dynamics in the central North Pacific pelagic ecosystem from a size-based perspective

Steven J. Barbeaux, John Horne and Jim Ianelli

A novel approach for estimating location and scale-specific fishing exploitation rates of eastern Bering Sea walleye pollock (*Theragra chalcogramma*)

Kai Zhang, Yoshiro Watanabe, Hiroshi Kubota, Atsushi Kawabata and Tomohiko Kawamura

Growth and survival of juvenile Japanese anchovy *Engraulis japonicus* in the Kuroshio-Oyashio transitional regions in 2010

Pavel Chernyshkov

Interannual variability of large-scale hydrometeorological processes in the northern parts of the Pacific and Atlantic Oceans and their probable impact on commercial fish migrations

Chiyuki Sassa, Motomitsu Takahashi, Kou Nishiuchi and Youichi Tsukamoto

Distribution, growth, and mortality of larval jack mackerel *Trachurus japonicus* in the southern East China Sea in response to habitat conditions

Peng Sun, Zhenlin Liang, Liuyi Huang and Xin He

Changes in fish phenotypic traits induced by trawl selectivity

Poster presentations

Pavel Mikheev

Relationships between Pacific salmon and residential fish in the Amur River basin

Svetlana Yu. Kordicheva, Alexei M. Orlov, Alexander A. Volkov, Pavel K. Afanasiev and Eugeny G. Shaikhaev

Preliminary results of the study of sablefish population structure within the Russian waters using DNA-markers

Wen-Bin Huang, Chih-Shin Chen and Wei-Ting Hsu

The spatio-temporal pattern of Pacific saury *Cololabis saira* abundance in the Northwestern Pacific

Yu-xue Qin, Ryo Koyama, Yosuke Koshino, Hideaki Kudo, Shigehiko Urawa and Masahide Kaeriyama

Spatiotemporal change in carbon and nitrogen stable isotopes of chum salmon during developmental

Eugene V. Samko and Nafanail V. Bulatov

The role of a warm anticyclonic eddy at Hokkaido (North-West Pacific) in the formation of saury fishing grounds

Indah Puspitasari and Chulwoong Oh

Population structure and reproductive biology of the lake prawn *Palaemon paucidens* (Caridea, Palaemonidae) from Goesan Lake, Korea

Oleg Ivanov

Nekton species structure in the Far East Seas and adjacent waters of the Pacific Ocean in 1980-2009

Ming-Ming Zhang, Chulwoong Oh, Wan-Ok Lee and Kyung-Jun Song

Reproductive biology of the largemouth bass, *Micropterus salmoides* from Goe-san Lake, Korea

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Ming-Ming Zhang, Chulwoong Oh, Wan-Ok Lee and Kyung-Jun Song

Age and growth of the catfish *Pelteobagrus fulvidraco* in Goe-san Lake, Korea

Youjung Kwon and Chang Ik Zhang

An ecosystem-based assessment and management system in Korean waters

Hiroshi Kuroda, Takashi Setou, Kazuhiro Aoki, Yoshitsugu Hagiwara and Hiroko Akabane

A numerical study of “shirasu” fishing ground formation based on the Kuroshio submesoscale model, south of Japan

Atsushi Tawa, Taku Yoshimura and Noritaka Mochioka

High dispersal of moray eel larvae to the open ocean: Early life history estimated from ocean-wide distribution patterns

Michail Kuznetsov

The influence of underwater vessel noise on fish behaviour and methods of its reduction

Graham E. Gillespie, Tammy Norgard, Sean MacConnachie, Lily Stanton and Jessica Finney

Program to assess the conservation status of the Olympia oyster, *Ostrea lurida*, in Canada

Hideki Nakano

International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean

POC Paper Session

Co-convenors: *Kyung-Il Chang (Korea) and Michael Foreman (Canada)*

Background

Papers were invited on all aspects of physical oceanography and climate in the North Pacific and its marginal seas, except those covered by POC-sponsored Topic Sessions.

List of papers

Oral presentations

Makoto Kashiwai

ToV analysis on watermass processes in the Sea of Okhotsk

Yohei Takano, Taka Ito and Curtis Deutsch

High-frequency variability of dissolved oxygen in the subpolar North Pacific

Michael Foreman, Wendy Callendar, Diane Masson, John Morrison and Isaak Fain

An update on the IOS regional climate model for the British Columbia continental shelf

Evgeny Vyazilov, Evgeny Uraevsky, Igor Rostov, Natalia Rudykh, Vladimir Rostov, Elena Dmitrieva and Andrey Golik

Far Eastern segment of the Unified State System of Information on the World Ocean (ESIMO)

Jae-Hun Park, Hanna Na, D. Randolph Watts, Kathleen A. Donohue and Ho Jin Lee

Near 13-day barotropic ocean response to atmospheric forcing in the North Pacific

Hiroyuki Tsujino, Shiro Nishikawa, Kei Sakamoto, Norihisa Usui, Hideyuki Nakano and Goro Yamanaka

Effects of large-scale wind variation on the Kuroshio path south of Japan in a 60-year historical GCM simulation

Olga Trusenkova

Intraseasonal SST oscillations in the Japan/East Sea

Jun-pen Zhang and Rong-shuo Cai

Modeling the East China Sea Cold Eddy responses to the inter-decadal climatic jump of the East Asian monsoon around 1976/77

Viktor Kuzin, Gennady Platov and Elena Golubeva

Influence of interannual variations of Siberian river discharge on the redistribution of freshwater in the Arctic Ocean

Vadim Navrotsky and Elena Pavlova

Biological effects of internal waves in coastal waters

Keiichi Yamazaki, Yujiro Kitade, Yosuke Igeta and Tatsuro Watanabe

Time variations of large amplitude near-inertial internal waves induced by typhoon observed around the Tango Peninsula, Japan

Takahiro Tanaka, Ichiro Yasuda, Kenshi Kuma and Jun Nishioka

Vertical turbulent iron flux sustains the Green Belt along the shelf break in the southeastern Bering Sea

Fangli Qiao and Chuan Jiang Huang

Comparison between vertical shear mixing and surface wave-induced mixing in the extra-tropical ocean

Young-Gyu Park, Jae-Hun Park, Ho Jin Lee, Hong Sik Min and Seon-Dong Kim

The effects of geothermal heating on the East Sea circulation

Andrey G. Andreev and Igor A. Zhabin

Origin of the mesoscale eddies and year-to-year changes of the chlorophyll *a* concentration in the Kuril Basin of the Okhotsk Sea

Aigo Takeshige, Tetsuya Takahashi, Hideaki Nakata and Shingo Kimura

Long-term trends in seawater temperature in Omura Bay, Japan

Masanori Konda, Tamami Ono, Kazuyuki Uehara, Kunio Kutsuwada, Osamu Tsukamoto, Fumiyoshi Kondo and Naoto Iwasaka

Ocean mixing layer variation as indicated by the measurement of the dissipation rate in the Kuroshio Extension region

Poster presentations

Igor Rostov, Vladimir Rostov, Natalia Rudykh, Elena Dmitrieva and Andrey Golik

Components of oceanographic and marine environment management information support in the Far Eastern region of Russia

Valentina V. Moroz

Thermohaline structure peculiarities formed by tides in the Kuril Straits archipelago and adjacent areas

Valentina V. Moroz

Thermohaline structure peculiarities formed in the Kuril Islands area and climate change

Yosuke Igeta, Tatsuro Watanabe, Akira Okuno and Naoto Honda

Strong coastal currents associated with winter monsoon around the Noto Peninsula, Japan

Sachihiko Itoh, Ichiro Yasuda, Masahiro Yagi, Satoshi Osafune, Hitoshi Kaneko, Jun Nishioka, Takeshi Nakatsuka and Yuri N. Volkov

Strong vertical mixing in the Urup Strait, Kuril Islands

Hiroshi Kuroda, Daisuke Takahashi, Takashi Setou, Tomonori Azumaya and Humio Mitsudera

Hindcast experiment for the Okhotsk Sea using the sea-ice-coupled Regional Ocean Modeling System

Tatsuro Watanabe and Koji Kakinoki

Interannual variation in the volume transport through the Sado Strait in the Japan Sea

BIO Workshop (W1)

Identifying critical multiple stressors of North Pacific marine ecosystems and indicators to assess their impacts

Co-Convenors: *Jennifer Boldt (Canada), Vladimir Kulik (Russia), Chaolun Li (China), Jameal Samhouri (USA), Motomitsu Takahashi (Japan) and Chang-Ik Zhang (Korea)*

Background

Multiple natural and human stressors on marine ecosystems are common throughout the North Pacific, and may act synergistically to change ecosystem structure, function and dynamics in unexpected ways that can differ from responses to single stressors. Further, these stressors can be expected to vary by region, and over time. This workshop seeks to understand responses of various marine ecosystems to multiple stressors, and to identify and characterize critical stressors in PICES regional ecosystems including appropriate indicators of their impacts. The goal is to help determine how ecosystems might change in the future and to identify ecosystems that may be vulnerable to the combined impacts of natural and anthropogenic forcing. Contributions are invited which identify and characterize the spatial and temporal extent of critical stressors in marine ecosystems (both coastal and offshore regions) of PICES member countries, and in particular the locations at which multiple stressors interact. Contributions will include a review and identification of broad categories of indicators which document the status and trends of ecosystem change at the most appropriate spatial scale (*e.g.*, coastal, regional, basin) in response to these multiple stressors. This workshop is linked with the Topic Session titled “*Ecosystem responses to multiple stressors in the North Pacific*” but is designed to provide more in-depth examination and discussion of the spatial and temporal extents of critical marine ecosystem stressors and their potential indicators. It will assist with progress towards the goals of PICES WG 28 on [Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors](#).

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Summary of Workshop

The BIO Workshop (W1) was held on Friday, October 12, 2012 (full day), and was launched with a talk by invited speaker, Dr. Natalie Ban (Australian Research Council Centre of Excellence for Coral Reef Studies, Australia) and included 6 other oral presentations.: Olga Lukyanova (TINRO-Centre, Russia), Stephani Zador (NMFS, USA), Christopher Mulanda Aura (Hokkaido University, Japan), Elliott Hazen (University of Hawaii and NMFS, USA), Jameal Samhouri (NMFS, USA), and Jennifer Boldt (Fisheries and Oceans Canada). In addition, there were general discussions after the morning presentations, and in-depth discussions in the afternoon.

Workshop presentations and discussion focused on three apparent approaches to evaluating stressors: (1) expert-based surveys, (2) model-based analyses, and (3) empirical/data based analyses.

The invited presentation was given by Dr. Ban who provided a view of cumulative human impacts in the marine environment, using an expert-based survey approach as well as combinations of all approaches. Utilizing the empirical analyses approach, Dr. Lukyanova introduced her research showing that eggs, embryos and larvae of marine fish and echinoderms may be used as bioindicators of early disturbances due to multiple stressor interactions in vulnerable ecosystems, in particular from hydrocarbons in water. Dr. Zador (presented by Ms. Patricia Livingston) summarized indicator-based ecosystem assessments in the Bering Sea and Aleutian Islands regions, utilizing a team-based approach, thereby addressing the expert-based survey approach. Three broad conclusions from this study were provided: (1) the physiological and biological nature of the ecosystem, the extent of scientific knowledge about the ecosystem, and the particular expertise of team members will influence the final assessment product; (2) team discussion of assessment structuring themes should occur before indicator selection, and (3) developing assessments should be an iterative process with frequent review by fisheries managers. Dr. Aura's presentation highlighted a model-based approach to evaluating stressors and features suitable for aquaculture sites in northern Japan. Dr. Aura's research included the development of a site suitability model, conducted using geographic information system (GIS)-based, multi-criteria evaluation (MCE) with weighted linear combinations to assess suitable scallop culture sites. For scallop culture, requisite biophysical (sea temperature, chlorophyll-*a*, secchi disk depth and bathymetry) and social infrastructure (distance to pier and town) parameters formed thematic layers that were limited by a constraint layer, and results were consistent with existing scallop culture locations. Dr. Hazen's presentation focused on the data-based analytical approach. He developed a quantitative indicator selection framework by looking for composite indices and links between pressure and state variables for the California Current region. Dr. Samhouri highlighted expert-based survey approaches to evaluating stressors. He compared and contrasted results from multiple efforts to elicit the opinions of regional experts about the vulnerability of coastal habitats along the U.S. west coast. These assessments encompass stressors as varied as pollution, climate change, invasive species, and overharvest in relationship to habitats from rocky shorelines and sandy beaches to the deep sea. Dr. Aseeva's presentation highlighted a data-based analytical approach to evaluating environmental stressors that explain fluctuations in flounder species composition on the shelf of West Kamchatka. Dr. Boldt gave an overview of the Indicators for the Seas 2 (IndiSeas2) research program, which uses all three approaches (data-based, model-based, and expert surveys) to evaluating stressors. The goal of IndiSeas2 is to evaluate the status of marine ecosystems in a changing world using a suite of indicators that reflect effects of multiple drivers on the states and trends of exploited marine ecosystems.

Morning Discussion

During the discussion after the morning presentations, workshop participants discussed the pros and cons of the three alternative approaches for evaluating stressors: (1) expert elicitation, (2) model-based simulation, and (3) empirical analysis (Table 1), as well as a general discussion on indicators.

Main discussion points:

- Some pros and cons derived from the presentations were listed by the group. There was general agreement that, despite pros and cons of each approach (Table 1), there is a need to use multiple approaches due to data availability and, where data are available, constraints and assumptions of analyses, *e.g.*, the constraint that

Principal Components Analyses represent only linear relationships, and that most approaches conducted to date of the impacts of multiple stressors assume their effects to be additive.

- The pros and cons of the three approaches depend on the objectives. For example, is the objective to know the state of ecosystems or to identify management interventions? WG 28 is looking at the state of ecosystems and ecosystem responses; linking that to management actions could be a next step.
- The selection of indicators and stressors will be affected by the behaviour of species and ecosystem properties (surroundings and hydrodynamics).
- The goal of WG 28 is not to forecast future indicator responses, but rather, to choose indicators (or at minimum to develop a process for choosing indicators of ecosystem responses to multiple stressors) that will be of interest in the future. One goal of WG 28 is to understand if ecosystems are responding to human activities (and climate), so that management actions can control human impacts. Separating human and climate effects is very difficult; can we identify indicators of interactions (*e.g.*, fishing and climate) that will help us identify deteriorating ecosystem conditions?

Table 1. Some pros and cons of three alternative approaches for evaluating stressors: (1) expert elicitation, (2) model-based simulation, and (3) empirical analysis.

Approach	Pros	Cons
Expert elicitation	Solution to the no data problem Appropriate for global and regional visualization	Difficult to validate responses
Empirical analysis	Track emerging stressors where expert input is untested or models are unavailable Appropriate indicators can be tailored to the physical and biological nature of ecosystem Remotely sensed data available for many physical variables	Difficult to find data at appropriate scales Least common denominator issue (shortest time series, smallest common spatial domain)
Model based analyses	Can generate as much data as you need Can create an ensemble of models using different frameworks	Must have a model Outputs are only as good as the data that go into the model

Afternoon discussion

After presentations in the afternoon, workshop participants discussed and compared indicators that are used in different regions to characterize the spatial and temporal extents of critical stressors and understand responses of ecosystems to multiple stressors.

Main discussion points:

- There was acknowledgement that indicators are collected and used for varying temporal and spatial scales, thereby making it difficult to combine indicators. One solution is to leave indicators disaggregated and ensure discussions around the indicator responses are framed within the varying response-times (and scales). Composite indices need to preserve enough information so that the driving factors of index variability are understood. Another related point raised was that what we see is how ecosystems respond to multiple stressors, and as part of our analyses we attempt to separate these responses into effects of individual stressors. We may not need to disaggregate individual effects of each stressor in order to choose appropriate indicators of ecosystem responses; however, we will need to tease these effects apart if we want to ensure a process-based understanding that can be used for forecasting the future.

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- The group then discussed and identified four groups of indicators, stressors, and activities: environmental, biological, human activities and stressors, and sociopolitical-economic. Broad categories of indicators were then listed for each of three of these groups (environmental, human activities and stressors, and sociopolitical-economic); this was *not* meant to represent a complete list, and could be supplemented with existing knowledge in the literature. For each country and each category of indicators (Table 2), member countries established the existence of data, and the temporal and spatial extent of the data (3 responses for each indicator). The tables were not filled out completely (indicators or data availability), but this could be a WG 28 activity. For the biological indicators, some information can be acquired from the work of PICES Working Group 19 on *Ecosystem-based Management Science and its Application to the North Pacific*, in their Ecosystem-Based Fisheries Management 2010 report (PICES Scientific Report 37, Table 3.1.3). Note that this table would not include information about data availability for habitats.

Table 2. Some broad-scale indicators identified in the workshop to address three main categories (environmental, human activities and stressors, and sociopolitical-economic). The tables were not filled out completely, but this could be a WG 28 activity. Biological indicator information can be acquired from the EBFM 2010 PICES Scientific Report 37, Table 3.1.3. Each cell contains three responses for the existence of data, availability of time series data, and spatial extent of data. Y = Yes, N = No, S = Some, N/A = Not applicable

Indicators, Activities, and Stressors	Canada	Japan	Russia	U.S.A.	High Seas
Environmental stressors/indicators					
Temperature					
Sea Ice					
Chla					
Nutrients	Y,Y,N	Y,Y,S	Y,Y,N	Y,Y,N	
River discharge	Y,Y,Y	Y,Y,Y	S,Y,N	Y,Y,Y	N/A
Toxic contaminants	Y,N,N	Y,N,N	Y,N,N	Y,N,N	S,N,N
Large scale climate index (e.g., PDO, ENSO)					
pH	Y,N,N	Y,N,N	Y,N,N	Y,N,N	Y,N,N
Oxygen	Y,Y,N	Y,Y,S	Y,Y,N	Y,Y,N	
Human activities & stressors					
Fishing	Y,Y,Y	Y,Y,Y	Y,Y,Y	Y,Y,Y	S,S,S
Oil and Gas					
Military Activity	N,N,N	N,N,N	N,N,N	N,N,N	N,N,N
Wave/Wind/Tidal					
Shipping					
Coastal engineering	Y,S,S	Y,S,S	Y,N,S	Y,N,S	N/A
Aquaculture					
Ecotourism					
Land-based pollution					
Socio-economic-political					
Seafood demand					
Coastal population trends	Y,Y,Y	Y,Y,Y	?,?,?	Y,Y,Y	N/A
Marine Employment	S,Y,Y	Y,Y,Y	N?,N?,N?	S,Y,Y	S,S,S
Marine Revenue					
Marine exports/domestic consumption					
Participation/stakeholder involvement					
Governance					
Happiness					
Satisfaction with ocean status					
Community vulnerability					
Coastal infrastructure					

Recommendations

- Use multiple approaches (expert elicitation, model-based simulation, and empirical analysis) to identify and evaluate critical multiple stressors of North Pacific marine ecosystems and indicators to assess their impacts.
- Finish filling out the tables with help from other PICES working groups, sections, and committees. For example, the Section on *Human Dimensions on Marine Ecosystems* could provide expertise on socio-economic indicators. The FIS and BIO committees could provide help on biological indicators and the MONITOR committee could provide expertise environmental indicators and stressors.
- A next step might be to identify the gaps in the tables and those that are important for which to get information.

List of papers

Oral presentations

Natalie C. Ban, Stephen S. Ban and Hussein M. Alidina (Invited)

Combining stressor information – Experiences from Canada’s Pacific waters and Australia’s Great Barrier Reef

Olga N. Lukvanova, Elena V. Zhuravel, Sergey A. Cherkashin, Denis N. Chulchekov, Viktor A. Nadtochiy and Olga V. Podgurskaya

Bioindicators of multiple stressors interaction in the North-Eastern shelf of Sakhalin Island (Sea of Okhotsk)

Stephani Zador, Kirstin Holsman, Sarah Gaichas and Kerim Aydin

Developing indicator-based ecosystem assessments for diverse marine ecosystems in Alaska

Christopher Mulanda Aura, Sei-Ichi Saitoh, Yang Liu and Toru Hirawake

Spatio-temporal model for mariculture suitability of Japanese scallop (*Mizuhopecten yessoensis*) in Funka and Mutsu Bays, Japan

Elliott L. Hazen, Jameal F. Samhuri, Isaac D. Schroeder, Brian K. Wells, Steven J. Bograd, David G. Foley, Nick Tolmieri, Phillip S. Levin, Greg Williams, Kelly Andrews, Sam McClatchie, William T. Peterson, Jay Peterson, Jessica Redfern, John C. Field, Ric Brodeur and Kurt Fresh

Ecosystem indicators for the California Current: A quantitative approach towards indicator development

Jameal F. Samhuri

Much ado about everything: Comparison of expert-based vulnerability assessments for coastal habitats along the U.S. west coast

Jennifer Boldt, Alida Bundy, Caihong Fu, Lynne Shannon and Yunne Shin

An overview of IndiSeas2: Evaluating the status of marine ecosystems in a changing world

Poster presentation

Nadezhda L. Aseeva

Reconstructions of flounder community on the shelf of West Kamchatka (Okhotsk Sea) under influence of environmental changes and interspecies relationships

BIO Workshop (W2)

Secondary production: Measurement methodology and its application on natural zooplankton community

Co-conveners: *Toru Kobari (Japan) and William Peterson (USA)*

Background

Zooplankton communities play important roles on the transfer of primary production to higher trophic levels of marine ecosystems. In the past two decades, the quantitative evaluation of the energy flow has been emphasized for better understanding how marine ecosystems respond to climate change and global warming. To date, primary production can be globally estimated with remote sensing techniques and validated with *in situ* experiments using radio or stable isotope. Although secondary production has been estimated with various methods (natural cohort, artificial cohort, molting rate, egg production, nucleic acids ratio, enzyme activity and empirical models), there is little information which method is relevant for natural zooplankton population or community. Thereby, we have little knowledge or confidence of secondary production measurements

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compared with that of primary production. In this workshop, the intent was to review current methodologies to measure secondary production. Through published reports of secondary production on natural zooplankton population or community, this workshop aimed to clarify the assumptions, advantages and disadvantages for each method. New techniques (nucleic acids ratio, enzyme activity, chitobiase, or other methods) and challenges in the calibration between the estimates using different methods were also discussed.

Summary of Workshop

Throughout the oral presentations, we clarified not only advantages but also disadvantages of the current methodologies used to estimate zooplankton production of natural zooplankton populations or communities. More direct measurements on body mass would be recommended for those who use the traditional methods (such as the “molt rate”), while these methods are laborious and time-consuming and need special care to eliminate artifacts. Biochemical approaches would take advantages to the traditional methods due to the simple protocols and quick measurements, but they need some calibrations of the parameters to the direct measurements.

Before discussion, we confirmed consensus to specify the target group for production estimation because “secondary production” means sum of production for wide taxonomic groups. As a first issue to be discussed, we confirmed the necessity of writing a review paper on current methodologies for estimating zooplankton growth rate because it is very helpful for our prospective activities. Second, we agreed that we should propose a new working group on zooplankton production (including a workshop/symposium at the PICES 2014 annual meeting) to the BIO Committee before PICES-2013. In the working group we will conduct an exchange program to compare methodologies by cross-calibration of biochemical methods (Nucleic acids ratio, AARS, Chitobiase) of growth and validation against traditional methods (Direct growth, Molting rate, Egg production, Physiological rate). The value to PICES and FUTURE is as follows. Researchers involved with modeling and monitoring as well as scientists associated with BIO, FIS and MONITOR consider aspects of zooplankton biomass and species composition in their work, but little attention is given to “rates” of growth and production. Since “rates” are likely to be more sensitive to environmental change than “biomass”, “rates” could be more sensitive to, and excellent early indicators of, environmental change than biomass alone. We suggest that both AP-COVE and AP-SOFE would be interested in incorporating a better understanding of zooplankton growth and production rates into (a) understanding of effects of climate variability on ecosystems (COVE) and (b) outlooks and ecosystem status (SOFE). A new PICES Working Group on Zooplankton Production would clarify (1) methods of measurements of rates, and (2) recommend a set of techniques that could be adopted by scientists of not only PICES but also ICES member countries.

Prospective activities

1. Make guidance to review advantages and disadvantages of the current methodologies for zooplankton production
2. Establish a PICES Working Group on Zooplankton Production.
3. Champion an international research program to compare methodologies (including proposal for funding)
4. Establish a cooperative network between PICES Working Group on Zooplankton Production and ICES Working Group on Zooplankton Ecology

Proposed Steering Committee for the proposed new Working Group

T. Kobari (KUFF), B.T. Peterson (NOAA), R. Escribano (IIO), L. Yebra (IEO), A. Sastri (UQAM), Hyung-Ku Kang (KIOST)



PICES-2012 Workshop (W2) (front row, from left) Lidia Yebra, Julie Keister, Rie Nakamura, Bill Peterson, Tracy Shaw, Pamela Hidalgo, Akash Sastri; (back row, from left) Hyung-Ku Kang, Keisuke Unno, Rubén Escribano, Atsuhiro Hirata, Sachi Miyake, Michael Dagg, Toru Kobari, Yasuhide Nakamura, and Jennifer Fisher

List of papers

Oral presentations

Lidia Yebra (Invited)

Biochemical indices of zooplankton production

Akash R. Sastri

Chitobiase-based measurements of crustacean zooplankton community biomass production rates: Method development and application in the NE subarctic Pacific

William T. Peterson, Jay Peterson and Jennifer L. Fisher

Use egg production of adult female copepods as a measure of secondary production

Hyung-Ku Kang

Secondary production of *Acartia steueri* and *A. omorii* (Copepoda: Calanoida) in a small bay, southeastern coast of Korea: The growth rate approach

Rubén Escribano and Pamela Hidalgo

Can temperature-dependent growth be used to measure secondary production of copepods in coastal upwelling systems?

Pamela Hidalgo and Rubén Escribano

The importance of rapid development to produce more biomass on a year cycle: Comparing some copepod species from the Humboldt Current

Yasuhide Nakamura, Atsushi Yamaguchi and Noritoshi Suzuki

Characteristics of zooplankton community in the Japan Sea: Biomass, stable isotope ratio and dominant taxa

Poster presentations

Lidia Yebra, Elisa Berdalet, Rodrigo Almeda, Verónica Pérez, Albert Calbet and Enric Saiz

AARS activity and RNA/DNA ratio as proxies for growth and fitness of *Oithona davisae* early developmental stages

Lidia Yebra, Sébastien Putzeys, Dolores Cortés, Ana Luisa Da Cruz, Francisco Gómez, Pablo León, Jesús M. Mercado and Soluna Salles

Application of biochemical tools to assess zooplankton metabolism in the coastal North Alboran Sea (SW Mediterranean)

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Toru Kobari, Shigeki Kori and Haruko Mori

Nucleic acids and protein contents as proxies for protein-specific growth of *Artemia salina*

Sachi Miyake and Toru Kobari

Nucleic acids and protein contents as proxies for starvation of marine copepods

Andrew G. Hirst, Julie E. Keister and numerous contributors

Assessing copepod growth rates using the Modified Moulting Rate Method

BIO Workshop (W3)

The feasibility of updating prey consumption by marine birds, marine mammals, and large predatory fish in PICES regions

Co-Convenors: *George Hunt, Jr. (USA), Hidehiro Kato (Japan) and Michael Seki (USA)*

Background

It has been 12 years since the publication of PICES Scientific Report No. 14 on "Predation by marine birds and mammals in the subarctic North Pacific Ocean" edited by Hunt, G.L. Jr., Kato, H., and McKinnell, S.M. This publication is the sole overview of the trophic requirements and trophic roles of marine birds and mammals for the North Pacific, and has been a much used reference by a wide variety of scientists including those interested in modeling the roles of marine birds and mammals. As of 2012, Google Scholar lists 49 citations of this report. In the 12 years since its publication, it has become rather considerably out of date. Our knowledge of the distribution and abundance of marine birds and mammals has advanced greatly, as has our knowledge of the food habits of a number of species. Additionally, there has been an increase in interest in the roles of large predatory fish in the world's oceans. Thus it would seem timely to provide an update of PICES Scientific Publication 14, and, if there is interest for it, to include information on prey consumption by large predatory fishes.

Workshop 3 tasks:

1. Review what has been learned about the distribution, abundance and prey habits of marine birds and marine mammals, and whether there have been sufficient advances to warrant conducting an update of PICES Scientific Report 14 *Predation by marine birds and mammals in the subarctic North Pacific Ocean*.
2. Explore the possibility of adding to a revision of PICES Scientific Report 14 information on prey consumption by large predatory fish.
3. Discuss and identify the mechanisms and sources of funding for conducting a new Report.
4. By the 2014 PICES Annual Meeting, provide a full report to the AP-MBM on the findings of Workshop 3.

Summary of Workshop

Workshop 3 met from 09:00 to 18:30 on October 12, 2012 in the Hiroshima. Fifteen scientists from three countries attended the workshop, and a few others dropped in for parts of the discussions. There were six presentations in the morning followed by discussions in the afternoon led by experts in the various taxonomic groups and regions. Presentations were accompanied by lively discussions, and all present participated in questioning the Presenters and Discussion Leaders.

From the presentations and discussions, it was clear that a great deal has been learned about the abundance and distribution of marine birds and marine mammals since the assembly of PICES Scientific Report 14. There is now far greater at-sea coverage of the distributions and abundance of marine birds and mammals than was available in the 1990s in both the eastern and western North Pacific Ocean. The breadth of seasonal coverage has also improved, at least in some areas, which will allow for the possibility of examining seasonal changes in prey consumption, and in developing information on the annual days of residency. It was also evident that in a few regions there were sufficient data to allow inter-decadal comparisons of the numbers of marine birds and mammals occupying a region. It was acknowledged that there should be a discussion of what the most

appropriate boundaries may be for calculation of prey consumption, and that that attention should be paid to quality control of the data used. An improvement over PICES Scientific Report 14 would be the inclusion of estimates of confidence intervals.

Overall, there appeared to be less progress in gaining new information on the prey habits of marine birds and mammals. However, particularly in the western North Pacific, there has been a significant improvement in our knowledge of prey use by marine mammals. Not unexpectedly, there was evidence of spatial and temporal variability in diets, which, in at least one case, was linked to inter-decadal changes in the stocks of commercially important fish.

The presentation and discussions of whether to include fish in a future overview of prey consumption by top predators centered on defining the goals of a future report and why the inclusion of fish might be important. It was agreed that understanding the roles and prey requirements of some of the most conspicuous top predatory fish could be useful in assessing their prey needs and the potential for competition among these fish and marine birds and mammals. Species that appeared to be most suitable for inclusion in an initial effort included bluefin tuna, albacore, one or two species of salmonids, blue shark, possibly salmon shark, and one or two gadids, such as walleye pollock and/or Pacific cod. Availability of data would be instrumental in the final determination of species to be included.

Decisions from the Workshop:

1. Workshop 3 participants agreed unanimously that it would be of value to update the information on prey consumption by marine birds and mammals throughout the PICES areas of the North Pacific Ocean where new data were available. This information would permit ecosystem modelers to account for prey consumption by marine birds and mammals more accurately than is presently possible. There was also recognition that an updated version of PICES Scientific Report 14 could facilitate the use of marine birds and mammals as indicators of ecosystem change in those regions in which sufficient data were available.
2. Workshop 3 participants agreed that it would be valuable to include a select group of large predatory fishes in the production of a new report on prey consumption by top predators. It was recognized that this could require a different approach than the regional approach used in PICES Scientific Report 14, as many of the fish species of interest are assessed on a basin-wide scale due to their highly migratory behavior.
3. Workshop 3 participants discussed the relative merits of seeking a formal working group under the auspices of the BIO and FIS committees, or of developing a less formal working group within the AP-MBM. It was agreed that the decision as to the framework for accomplishing a new report on prey consumption by marine birds, mammals and select fish species should be decided by the AP-MBM with due consideration for their ongoing commitments.
4. Workshop 3 participants agreed that suggestions for the leadership and potential membership of a new group assessing prey consumption should be made by the membership of the AP-MBM, once they have the opportunity to assess the ability to take on a new initiative and how it might fit within their plans for examining the spatial ecology of marine birds and mammals in the North Pacific.
5. Workshop participants agreed that there would be a need to devote considerable effort to assemble and integrate the wealth of new knowledge on the distribution and abundance of marine birds and mammals and their diets. These tasks were seen as requiring one or more dedicated scientists for at least two years and possibly three. Additionally resources would be required to assemble the required data on the biomass of the fish species of interest, their prey habits and their rates of prey consumption. The possibility of seeking support from the North Pacific Research Board and the U.S. National Science Foundation was discussed. Should the revision of PICES Scientific Report 14 go forward, the possibility of approaching ESSAS for support was discussed.

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Acknowledgments

The Workshop Convenors thank PICES for support of an invited speaker, Gary Drew and Martin Renner for their expeditious work in preparing the North Pacific Pelagic Seabird Database and maps and tabulations of recent survey effort, and travel support for GLH from the IMBER Regional Program, Ecosystem Studies of Sub-Arctic Seas (ESSAS).

List of papers

Oral presentations

Robert J. Olson (Invited)

Data availability for estimating prey consumption by large pelagic fishes, particularly tunas, in the PICES region

Tsutomu Tamura and Kenji Konishi

Prey consumption and feeding habits of three baleen whale species in the western North Pacific

Kaoru Hattori, Yoko Goto, Mari Kobayashi and Orio Yamamura

Food habits of pinnipeds in Japanese waters: A review

Yutaka Watanuki

Diet study of seabirds breeding in Japan

Sayaka Nakatsuka, Daisuke Ochi, Yukiko Inoue, Kotaro Yokawa, Hiroshi Ohizumi, Yasuaki Niizuma and Hiroshi Minami

The food composition of Laysan and Black-footed Albatrosses in the North Pacific from 2010 to 2011

George L. Hunt, Jr., Martin Renner, Kathy Kuletz, Gary Drew and John Piatt

Seabird numbers, days of occupancy, and prey habits in the Gulf of Alaska and the eastern Bering Sea

Mike Seki Lead

Discussion: Should we include fish, and if so, what species?

Yutaka Watanuke Lead

Discussion: How much can we add about seabirds in the Western Pacific?

George L. Hunt, Jr. Lead

Discussion: How much can we add about seabirds in the Eastern Pacific?

Hidehiro Kato Lead

Discussion: How much do we know about cetaceans in the Western Pacific?

Kaoru Hattori Lead

Discussion: How much do we know about pinnipeds in the Western Pacific?

Rolf Ream Lead

Discussion: How much do we know about pinnipeds in the Eastern Pacific?

Rolf Ream Lead

Discussion: How much do we know about cetaceans in the Eastern Pacific?

ESSAS/PICES Workshop Subarctic–Arctic interactions (W4)

Subarctic–Arctic interactions

Co-Convenors: *Kenneth Drinkwater (ESSAS/Norway), Jackie Grebmeier (ESSAS/USA), James Overland (PICES/USA) and Sei-Ichi Saitoh (PICES/Japan)*

Background

Exchanges of water masses and their associated flora and fauna strongly link the marine Arctic and the Subarctic. Both regions have undergone significant warming, and there has been reduced sea-ice in recent years in some regions. Climate change scenarios indicate that these regions are likely to experience even greater warming and transformation in the future. To better understand how climate variability and change will

affect these marine ecosystems from biogeochemical processes, through the food web to the highest trophic levels, it is essential to improve our knowledge of the role of physical and biological fluxes between the Subarctic and Arctic and the fate of the transported organisms. Therefore, this workshop examined the influence of the warm Subarctic inflows on the physical conditions and biology in the Arctic basin and shelves, as well as the role of fluxes of water from the Arctic basin onto the surrounding shallow shelves and into the Subarctic. Papers that cover multiple trophic levels or investigate biophysical coupling were especially sought. Also, presentations on the observed changes that are occurring as well as those on possible scenarios under climate change were encouraged. Emphasis will be on the Arctic-Pacific Ocean linkages but those considering the exchanges in the Atlantic were also welcome.

Summary of Workshop

This 1-day ESSAS (Ecosystem Studies of Sub-Arctic Seas)/PICES sponsored workshop consisted of 9 oral presentations and 2 posters and represented contributions from 4 different countries. Most of the talks and the 2 posters focused upon the Pacific-Arctic sector but there were also 2 talks that made comparisons between regions within the Pacific to the Atlantic sectors.

The workshop was told that the Bering Sea circulation structure is strongly sensitive to the wind direction, which is set by the relative positions of the Aleutian Low, the Siberian High and the Beaufort High. Southeasterly winds, especially in winter, produce a broad flow over the Bering Sea shelf that eventually flows through Bering Strait. In contrast, under northwesterly winds, much of the flow over the Bering Sea shelf is southward, away from the Bering Strait. At such times, the flow through the Bering Strait into the Arctic is derived from an intensification of the Anadyr Current, which delivers nutrient-rich waters into the Chukchi Sea. The ecology of the Chukchi Sea is also strongly influenced by advection from the Bering. Observations reveal abundant resting phytoplankton cells in the sediments in the northern Bering Sea during the winter. The majority rise towards the surface in the spring, initiating a spring bloom. However, some are believed to be advected into the Chukchi Sea, contributing to its spring bloom. Some resting cells of ice algae rise off the sediments in the late fall to be incorporated into the ice that forms. Zooplankton from the Bering Sea are advected through Bering Strait in most years, resulting in Pacific species dominating the region north of Bering Strait. In some years, this community structure stretches north of Lisburne Peninsula.

Another talk showed the importance of meso-scale eddies in the Canada Basin. High chlorophyll-*a* values were observed in these eddies, due to entrainment of high quantities of phytoplankton and nutrients from off the Beaufort Shelf. These eddies are a mechanism that transport primary production from the shelf into the Basin.

Comparisons of the reproductive strategies of walleye pollock and Arctic cod showed that the former spawns in 2–8°C temperatures in the Bering Sea while the later spawns in 0–2°C primarily in the Chukchi Sea. The hatching rate of pollock is temperature-dependent but not so for Arctic cod. Another presentation showed a general northward movement of fish species in the southeastern Bering Sea, mostly in response to local warming. Fish have also tended to shoal because of the replacement of cold pool water by warmer waters in the shallow depths. Distributional changes were driven mostly by changes in population density and secondly by temperature and along-shelf winds.

Spatially-explicit Distributed Biological Observatories (DBOs) have been established as a latitudinal “change detection array” that can track advection from the Bering Sea into the Chukchi Sea as well as the biological response to sea ice retreat and environmental change. International cooperation is resulting in multiple occupations in 5 different DBOs. Data indicate seasonal freshening and warming as Pacific seawater transits northward over the spring to fall season, with potential impacts on both plankton and benthos. Observations have also showed changes in benthic dominant macrofauna and biomass at benthic hotspots in the region.

The final two oral presentations dealt with comparative studies. The first compared the Chukchi and Barents seas. The main question being asked was why is fish production in the Barents Sea two orders of magnitude

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larger than in the Chukchi Sea in spite of the fact that the estimated primary production is similar. The main conclusion was that the year-round inflow of warm Atlantic waters provide a refuge for boreal fish species even in winter in the Barents Sea, whereas in the Chukchi Sea the waters are too cold in winter to allow many fish to overwinter and do well there. Also, the generally colder waters in the Chukchi Sea limit the growth rates of those fish that inhabit its waters. The second paper compared the role of advection between the Arctic and the subarctic in the Pacific and Atlantic sectors. In the Pacific sector there is mainly a one-way, near surface flow through Bering Strait into the Arctic. In contrast, in the Atlantic sector there is a two-way exchange in Fram Strait with the warm Atlantic inflow being subsurface. Warm Pacific water has contributed to the increasing rate of Arctic ice melt but because of the subsurface inflow through Fram Strait, its effect on ice melt is greatly reduced. Large quantities of ice are exported through Fram Strait with accompanying ice biota but little to no ice from the Arctic leaves through the Bering Strait. Both gateways to the Arctic allow phytoplankton and zooplankton to be advected from the subarctic into the Arctic but few if any survive through the year.

Two poster contributions were also presented at the workshop. One compared the partial pressure of CO₂ in several regions from the Antarctic to the Arctic. Over approximately the last decade, the carbon sink has varied differently by region. There were increases in the Antarctic, a decline in the Taiwan Strait and relative stability in the Bering Basin, although with large variability in the Bering Slope region, on the Bering Shelf, and in the Chukchi Sea. The second poster described the Pacific Arctic Group, which is an international consortium that collaborates on scientific activities in the Arctic.

Discussion at the end of the session highlighted the need to further long-term observations, including flux measurements and the advection of fish larvae. In terms of modeling, increased effort is needed on dealing with sea ice and its variability. Finally, further comparative studies of the role of advection between the Arctic and subarctic was encouraged.

List of papers

Oral Presentations

Seth L. Danielson, Tom Weingartner, Kate Hedstrom, Knut Aagaard, Enrique N. Curchitser, Jinlun Zhang and Rebecca A. Woodgate (Invited)

The Bering Sea shelf circulation and its role in Pacific-Arctic exchanges

Ichiro Imai, Chiko Tsukazaki, Kohei Matsuno, Ken-Ichiro Ishii and Atsushi Yamaguchi (Invited)

Abundant distribution of diatom resting stage cells in bottom sediments of Bering Sea and Chukchi Sea: Possible seed populations for blooms

Eiji Watanabe, Michio J. Kishi, Akio Ishida, Maki N. Aita and Takeshi Terui (Invited)

Biological hot spots emerging along the pathway of Pacific summer water in the western Beaufort Sea

Atsushi Yamaguchi, Rie Ohashi, Kohei Matsuno and Ichiro Imai

Interannual changes in the zooplankton community structure on the southeastern Bering Sea shelf and Chukchi Sea during summers of 1991–2009

Yasunori Sakurai, HaeKyun Yoo and Jun Yamamoto

A comparison of reproductive characteristics and strategies between walleye pollock (*Theragra chalcogramma*) and Arctic cod (*Boreogadus saida*)

Franz J. Mueter, Mike A. Litzow, Seth L. Danielson, Paul D. Spencer and Robert R. Lauth

The roles of temperature, abundance and advection in modifying the spatial dynamics of groundfish at the Subarctic-Arctic boundary in the eastern Bering Sea

Jacqueline M. Grebmeier

The Distributed Biological Observatory (DBO): A change detection array in the Pacific Arctic region

George L. Hunt, Jr., Arny Blanchard, Peter Boveng, Padmini Dalpadado, Kenneth F. Drinkwater, Lisa Eisner, Russ Hopcroft, Kit Kovacs, Brenda Norcross, Paul Renaud, Marit Reigstad, Martin Renner, Hein Rune Skjoldal, Andy Whitehouse and Rebecca A. Woodgate

The Barents and Chukchi Seas: Comparison of two Arctic shelf ecosystems

Kenneth F. Drinkwater

On the role of advection on the interaction between the Arctic and Subarctic seas: Comparing the Atlantic and Pacific sectors

Poster Presentations

Zhongyong Gao, Heng Sun and Liqi Chen

Comparison of decadal changes in the carbon sink and potential responses to climate change in the Taiwan Strait, Bering Sea and bipolar regions

Jacqueline M. Grebmeier and Takashi Kikuchi

The Pacific Arctic Group (PAG): A Pacific perspective on Arctic science

BIO Workshop (W5)

Comparison of multiple ecosystem models in several North Pacific shelf ecosystems (MEMIP-IV)

Co-Convenors: *Harold Batchelder (USA), Shin-ichi Ito (Japan), Angelica Peña (Canada) and Yvette Spitz (USA)*

Background

This will be the first MEMIP (Marine Ecosystem Model Intercomparison Project) workshop where we have completed model comparisons within single shelf systems; *e.g.*, within the Northern California Shelf, Gulf of Alaska shelf and Oyashio shelf and offshore, individually. The workshop tasks will be to undertake quantitative assessment of the successes and shortcomings of individual models within regions and across regions. This formal skill assessment is a key activity to enable MEMIP to identify which, if any, of the various ecosystem models have broad skill spatially and temporally in multiple North Pacific shelf ecosystems. The observations (nutrients, chlorophyll and zooplankton biomass) from the key years of simulation (2000-2003) have been compiled to enable model-data comparisons for each of the three regions. To our knowledge this will be the first multiple model skill assessment that extends to zooplankton, *e.g.*, beyond phytoplankton, and the first that focuses on ecosystem models applied to coastal systems.

Summary of Workshop

The workshop began with a review of the goals for the project from 2011 to 2012. That was followed by a summary of the discussions that were held during 4 days at the MEMIP workshop in Corvallis, USA, in March 2012 attended by Angelica Peña, Jerome Fiechter, Hal Batchelder and Yvette Spitz. A summary of that workshop and the activities planned to occur between March 2012 and October 2012 is described in the BIO Committee report. Workshop W5 had one formal presentation by Dr. Jarrod Santora.

The group was updated on the stumbling blocks encountered in finalizing the physical testbeds that provide the foundation for the coupled modeling. In short, the original premise that a two-dimensional spatial (cross-shelf by depth) domain would serve as the testbed was found to be flawed, and led to spurious and unrealistic physical results, probably caused by instabilities. There were hints of problems as early as March 2012, but we believed they could be solved. It was not to be, so the approach was reformulated to use three-dimensional physical models for each domain. This is reflected in the revised workplan for the MEMIP.

The workshop was initially scheduled for October 12–13, 2012; however, due to delayed progress in having the physical test bed simulations completed by July 2012, most of the coupled biophysical simulations of the three testbeds were not completed. It was unfortunate that two members (Drs. Peña and Shin-ichi Ito) of the core MEMIP team had to attend meetings of other PICES expert groups during these two days. If the four co-convenors of the MEMIP workshop, and Dr. Fiechter, had been available for both days of the workshop, there may have been an opportunity to utilize the second day of the scheduled workshop. In the end, the group met for about 5.5 hours on October 12, only. In the future, it would be preferable if key members, including co-chairs of a workshop in this case, were not scheduled to participate in other simultaneous meetings. Eleven scientists attended the first half day of W5. During those discussions, which had the benefit of email communication with MEMIP member, Jerome Fiechter in the USA, who was unable to attend PICES-2012, a

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plan was developed to complete the comparisons of three coastal ecosystem models (see the MEMIP project report in the BIO Committee Annual Report).

List of papers

Oral presentations

Jarrod A. Santora, William J. Sydeman, Monique Messié, Fei Chai, Sarah Ann Thompson, Brian K. Wells and Francisco P. Chavez

Triple check: Spatio-temporal observations of krill and seabirds verifies structural realism of an ocean ecosystem model

Yvette Spitz (Chair)

Work Session 1: Overview of MEMIP Model Status. Update on progress since Oct 2011.

Hal Batchelder (Chair) / Angelica Peña (Chair)

Work Session 2: MEMIP Impressions, Recommendations, Stumbling Blocks

Hal Batchelder (Chair)

Coupled model results/new simulations/*etc.*

Angelica Peña (Chair)

Work Session 4: Coupled model results/new simulations/*etc.* (*continued*)

Workshop Convenors

Day 1 Wrap-up: Open Discussion of Progress and Planning Day 2

Yvette Spitz (Chair) / Hal Batchelder (Chair)

Skill Assessment: Example of SA using Newport Spitz model

Hal Batchelder (Chair) / Angelica Peña (Chair)

Work Session 5: Continue model simulations and/or skill assessments

Yvette Spitz (Chair) / Hal Batchelder (Chair)

Work Session 6: Continue model simulations and/or skill assessments

Yvette Spitz (Chair) / Hal Batchelder (Chair)

Work Session 7: Continue model simulations and/or skill assessments

Yvette Spitz (Chair) / Hal Batchelder (Chair)

Work Session 8: Continue model simulations and/or skill assessments

Workshop Convenors

Workshop Wrap-up: Accomplishments, Progress Report, Future Steps, Requests to BIO (if any)

MEQ Workshop (W6)

The contrasting cases of HABs in the eastern and western Pacific in 2007 and 2011

Co-conveners: Changkyu Lee (Korea) and Mark Wells (USA)

Background

Harmful algal blooms reached historic levels along coastlines of the eastern Pacific in 2011, but similar blooms were minimal to non-existent in Japan, Korea and Russia. The situation was largely reversed in 2007, and this disparity between these years offers a unique opportunity to compare and contrast the basic environmental parameters and HAB dynamics during these regimes. Combining these observations with a broader overview of the basin-scale physical dynamics during this time frame would provide new insights to the factors enhancing these blooms. The workshop foundation was the pre-submission of available data from member countries, including but not limited to: HAB species presence and abundance, time of year, temperature range, salinity range, water clarity, wind, river flow (flooding), and upwelling indices. Workshop participants were to review and discuss the trends and patterns in these data over the first day, and integrate them with information on the basin-scale physical dynamics. Participants were to develop a detailed outline for manuscript preparation during the second day, with agreed writing assignments and draft submission deadlines.

Summary of Workshop

The motivation for this workshop stemmed from a trend in observations showing that Harmful Algal Blooms (HABs) achieved historic impact levels in 2011 along eastern Pacific coastal regions, whereas only minimal corresponding outbreaks occurred in many regions of the western subarctic Pacific. Moreover, this situation was largely reversed in 2007, suggesting there is a potential linkage between basin-scale forcing factors and HAB dynamics in coastal waters. The initial phase of the 1.5 day workshop focused on in-depth presentations on intercomparison of toxic blooms, fish killing HAB blooms, and high biomass HAB events in 2007 and 2011, along with an assessment of the potential linkage between the tsunami of the Great East Japan Earthquake and the resultant distribution of toxic dinoflagellates in Tohoku coastal areas of Japan. Dr. William Peterson and Dr. Sanae Chiba, invited speakers at the workshop, put these local or regional HAB observations into a wider basin-scale perspective by presenting their work and insights on the influence of atmospheric forcing factors (PDO, MEI, NPGO) on the physical and ecosystem dynamics in Pacific oceanic and nearshore waters. This information, new to many HAB Section members, provided a more system-wide outlook on factors likely to influence regional scale oceanography and HAB events.

In the second phase of the workshop, participants divided in to small teams to assess and distill the primary implications of these data, observations, and insights. Each team was charged with identifying the most compelling findings, which then were debated in a full workshop discussion. The hypothesis that emerged was “The variability in basin-scale climate forcing (PDO, MEI, NPGO) shapes the intensity and duration of HABs in North Pacific coastal waters in conjunction with local driving factors”. More specifically, participants felt that local forcing was particularly evident in semi-enclosed basins while broader-scale forcing was indicated along open coastlines. A plan was developed to begin testing this hypothesis by identifying specific regions and years for more detailed assessment. As first step, each PICES member country will identify two sentinel sites (or regions) where possible, one in a semi-enclosed region or basin and one along an open coastline. The participants will focus on three broad HAB categories; Fish Killing events, Toxic events (bivalves), and High Biomass events. A unified database will be developed to record the occurrence and qualitative intensity in these regions over the last ten years, thus encompassing the North Pacific regime shift in 2005. Each event will be categorized in terms of the toxic level, cell concentration, fisheries damage, or other human impact (e.g., for high biomass events), as well as the duration of event, the spatial extent of the event, and the seasonal timing of event. This unified database will enable assessment of the basin-scale patterns in HAB events from which selected years and sites will be assigned for more in depth intercomparison. Point persons for data collection from each country were identified, and participants agreed upon a timeline for the initial and secondary data collections. The joint findings will be assembled into a draft manuscript for presentation to the HAB Section in Fall, 2013.

These workshop findings result from the unique and productive collaboration among nations that could not come about without the PICES organization. The thrust of the workshop, and the direct findings and insights, directly address two FUTURE research themes:

1. What determines an ecosystem’s intrinsic resilience and vulnerability to natural and anthropogenic forcing?
2. How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future?

List of papers

Oral presentations

Takashi Kamiyama, Hiroyuki Yamauchi, Shinnosuke Kaga, Satoshi Nagai and Mineo Yamaguchi

Effects of the tsunami by the Great East Japan Earthquake on distribution of *Alexandrium* cysts and risk of PSP occurrence in Tohoku coastal areas in Japan

Ruixiang Li, Zongling Wang and Mingyuan Zhu

Harmful Algal Blooms in coastal water of China in 2011

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William T. Peterson (Invited)

The potential influence of local physical forcing (factors related to coastal upwelling) and basin-scale forcing (factors related to ENSO and the PDO) on harmful algal bloom in the Oregon upwelling zone

Sanae Chiba (Invited)

Contrast of the lower trophic level responses to climatic forcing over the eastern and western North Pacific

Tatyana Yu. Orlova, O.G. Shevchenko, Inna V. Stonik and Vladimir M. Shulkin

Cases of HABs in 2007 and 2011 in Peter the Great Bay (East/Japan Sea), Russia

Svetlana Esenkulova and Nicola Haigh

Bloom dynamics of *Heterosigma akashiwo* in coastal waters of British Columbia (BC), Canada in 2007 and 2011; Data from the Harmful Algae Monitoring Program

Chang-Hoon Kim and Ji Hoe Kim

Monitoring and development of PSP toxins along the south coast of Korea

Changkyu Lee

HAB DATA 2007 and 2011 - Korea

Shigeru Itakura

HAB DATA 2007 and 2011 - Japan

Charles Trick

HAB DATA 2007 and 2011 - Canada

Vera Trainer

HAB DATA 2007 and 2011 – USA

Poster Presentations

Junya Tomita, Tomoki Nishiguchi, Motoaki Yagi, Daekyung Kim and Tatsuya Oda

Evaluation of toxic potential of newly isolated *Chattonella antiqua*, by laboratory exposure experiments and micro-bioassay using cultured cells

Hao Guo, Xu Xiao-man and Li Xia

Red tide survey and information system in Dalian Port

Feng-ao Lin, Hao Guo, Yongjian Liu, Daoyan Xu and Xingwang Lu

High-incidence HABs species in China Coastal Waters and the forewarning method based on the HABs Risk Index

SCOR/PICES Workshop (W7)

Global patterns of phytoplankton dynamics in coastal ecosystems

Co-convenors: *Kedong Yin (China) and Hans Paerl (USA)*

Background

Phytoplankton biomass and community structure have undergone dramatic changes in coastal ecosystems over the past several decades in response to climate variability and human disturbance. These changes have short- and longer-term impacts on global carbon and nutrient cycling, food web structure and productivity, and coastal ecosystem services. There is a need to identify the underlying processes and measure rates at which they alter coastal ecosystems on a global scale. Hence, the Scientific Committee on Ocean Research (SCOR) formed Working Group 137 (WG 137) on Global Patterns of Phytoplankton Dynamics in Coastal Ecosystems: Comparative Analysis of Time Series Observations (<http://wg137.net/>). To address fundamental questions that emerged, WG 137 would use data compiled from 84 sampling stations, representing research and monitoring programs spread across five continents, and would seek additional time series of coastal/estuarine/near-shore phytoplankton and relevant hydrographic data. Investigators with decadal observational data were encouraged to contribute to this growing compilation and discuss interests in collaboration. The wealth of information in these data sets provides an unprecedented opportunity to develop a global analysis and investigation of the dynamics and status of ecosystems where land and sea meet. The workshop was intended to cover conceptual models of phytoplankton community variability and quantitative approaches for extracting patterns from time series.

Summary of Workshop

Workshop W7 was a joint SCOR WG 137/PICES workshop. The meeting objectives were for participants to: (1) present progress made on data synthesis and cross-system comparisons of anthropogenic and climatic impacts on coastal phytoplankton community structure and function since the WG 137 1st and 2nd meetings, (2) review and revise research questions, (3) discuss the approaches (what data sets to use, what analysis to perform, *etc.*) needed to address questions and formulate the framework (outline) of papers related to the questions, and (4) determine take-home assignments for preparing publications.

W7 invited Dr. William Li from the Bedford Institute of Oceanography, Halifax, Canada, who gave a presentation on “*An ecological status report for phytoplankton and microbial plankton in the North Atlantic and adjacent seas*” by ICES Working Group on Phytoplankton and Microbial Ecology (WGPME). This excellent, thought-provoking presentation stimulated much cross-disciplinary discussion on climatically and anthropogenically altered trends in oceanic and coastal phytoplankton communities, and it stressed the overall importance of the <3 µm diameter picophytoplankton in the world’s oceanic and coastal waters.

There were several additional coastal phytoplankton dynamics presentations by PICES participants in the open session component of the WG 137 workshop. These included participants from Canada, Japan, Korea, Russia, and Spain.

Overall, there were over 30 participants with 11 participants making presentations. In particular, Dr. Todd O’Brien reported data sets available for use by participants. He has developed the <http://WG137.net> web site, which contains links to an interactive map and data and site summary tables that list and link to standard summary pages for each of the existing time series sites.

Two new online time series tools are available to the WG137 community. The COPEPOD Interactive Time-series Explorer (COPEPODITE, <http://www.st.nmfs.noaa.gov/copepodite/>) is a publicly available, online toolkit that allows any user to upload their own time series data and select from a variety of standard analysis and visualizations to be applied their data. The second tool is the Multi-Site Time-Series Explorer (MSTSE). This tool is not public; access is controlled by email-based login.

W7 participants also discussed questions for future publications as follows.

- Do changes in nutrient supplies, sources (new vs. regenerated), concentrations and ratios cause shifts in phytoplankton biomass and community composition?
 - Subquestion 1: nutrients vs species diversity
 - Subquestion 2: nutrients vs community status
 - Subquestion 3: ammonium/nitrate, Si, vs community structure (diatoms/(diatoms+dinos)), hypothesis HN4, or DON favours dinoflagellates
- Are there temperature thresholds that determine dominance of different phytoplankton groups and do temperature regimes and ranges govern interactions?
- How is phytoplankton cell size a reflection of environmental conditions across systems?
- How does variability of hydrology/salinity, residence time influence phytoplankton
- How to establish the relationship between residence times and phytoplankton community structure
- What are the common seasonal patterns along single species & communities?
- How much local scale variation can be explained by progressively larger scale variation?
- What role does bottom-up vs. top-down processes play in regulating planktonic communities? To what extent does phytoplankton composition affect food quality?

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We appreciate the opportunity to have had the WG 137 Workshop in conjunction with the PICES Annual Meeting. The participation of PICES attendees added both new information on potentially useful long-term data sets and dimensionality to the Workshop.

List of papers

Oral presentations

William K.W. Li, Todd D. O'Brien and Xosé Anxelu G. Morán (Invited)

An ecological status report for phytoplankton and microbial plankton in the North Atlantic and adjacent seas

Jacob Carstensen, Hans W. Paerl and James E. Cloern

The phytoplankton composition across the world's coastal ecosystems

Todd D. O'Brien

COPEPODITE: An online toolkit for plankton time series analysis and visualization

N. Ramaiah

Anthropogenic influences on phytoplankton compositional variability in coastal waters

Kedong Yin and Paul J. Harrison

Anthropogenic influence on phytoplankton community structure: Long time series data analysis in Hong Kong coastal waters

Yury I. Zuenko

Conditions of phytoplankton blooms at Primorye coast (Japan/East Sea) and year-to-year change of their timing

Poster Presentations

Hyeon Ho Shin, Jong Sick Park, Young-Ok Kim, Seung Ho Baek, Dhongil Lim and Yang Ho Yoon

Dinoflagellate cyst production and flux in Gamak Bay: A sediment trap study

Dolores Cortés, Ana Luisa Da Cruz, Francisco Gómez, Pablo León, Jesús M. Mercado, Sébastien Putzeys, Iria Sala, Soluna Salles and Lidia Yebra

Time variability of the taxonomical composition and the physiological performance of diatom-dominated assemblages in an area affected by coastal upwelling

Inna V. Stonik and Tatyana Yu. Orlova

Population dynamics and toxicity of the diatom species of the genus *Pseudo-nitzschia* in Peter the Great Bay, the northwestern part of the Sea of Japan

Ah-Ra Ko, Se-Jong Ju, Ho Young Soh and Kyoungsoon Shin

Understanding seasonal variation of the source of particulate organic matter in relationship with plankton community in the estuary of Sumjin River, Korea

FIS Workshop (W8)

Recruitment of juvenile Japanese eel (*Anguilla japonica*) in eastern Asia

Co-Sponsored by: *FRA*

Co-convenors: *Ruizhang Guan (China), Tatsu Kishida (FRA, Japan), Akihiro Mae (Japan), Tae Won Lee (Korea), Wann-Nian Tzeng (Chinese Taipei) and Kazuo Uchida (FRA, Japan)*

Background

Japanese eel is one of an important fisheries resource in the eastern Asia. In recent three years, however, catch of glass eel in this area has remained in low level. In view of this situation, we recognized the necessity to investigate the reason why recruitment of glass eel decreased and consider the proper management measures on this resource. Because Japanese eel distributes throughout the eastern Asia, we planned the international workshop to discuss these issues. The purpose of this workshop is to discuss on 1) the mechanisms and reasons of the inter-annual variability of the recruitment of glass eel to the coastal area of the eastern Asia,

2) effective measures for sustaining the glass eel recruitment, 3) necessary information exchange and 4) how to enhance the international collaboration in order to sustain the resource of Japanese eel.

Summary of Workshop

Prof. Wann-Nian Tzeng (National Taiwan Ocean University) chaired the first session. Dr. Kazuo Uchida of Fisheries Research Agency of Japan (FRA) reviewed the life history of Japanese eel, including the results of the newest studies using otolith analysis of spawning adults collected in spawning grounds. Dr. Seinen Chow (FRA) lectured on the discovery of mature eels in the spawning area, the first case in the world, and on the oceanic migration. Dr. Tomowo Watanabe (FRA) talked about oceanographic conditions in spawning grounds as well as larvae transportation areas of the Japanese eel.

Prof. Tae Won Lee (Chungnam National University, Korea) chaired the second session constituting lectures from each nation/area. Dr. Hiroaki Kurogi (FRA) discussed ecology and annual recruitment levels of Japanese eel in Japan; Prof. Tae Won Lee lectured on ecology and recruitment of Japanese eel in Korea; Prof. Ruizhang Guan (Jimei University, China) made a presentation on ecology and annual recruitment levels of Japanese eel in continent China; and Prof. Tzeng lectured on spatial and temporal variations in the recruitment of Japanese eel in Taiwan. They discussed yearly fluctuations of glass eel catch and possible causes of decrease of catch in their nations. The third session was chaired by Prof. Ruizhang Guan. Dr. Tatsu Kishida (FRA) reviewed the management measures for eel in Europe as a reference for the participants to consider in the management of Japanese eel.

Lastly, Dr. Kazuo Uchida chaired the general discussion. Possible causes of the stock decline pointed out by plural nations are: (1) reduction of habitat in inland freshwater and coastal areas, (2) overfishing and (3) changes in oceanic conditions. In order to recover and sustain the stock of Japanese eel, the workshop concluded that it is necessary to implement (1) international cooperation on collecting fishing data, (2) advancing research and study on the distribution and migration of Japanese eel, (3) strengthening the stock management for both glass eel and adult eel in each nation/area as a first step, (4) conservation of habitat and environment in rivers and coastal areas, and (5) evaluation of the stocking effectiveness of eel. The importance of the continuation of information exchange and building the framework for this purpose were also recognized.

List of papers

Oral Presentations

Kazuo Uchida

Life history of Japanese eel (review)

Seinen Chow, Toshihiro Yamamoto, Hiroaki Kurogi, Makoto Okazaki and Tomoo Watanabe

Discovery of mature freshwater eels in the spawning area and remarks on the oceanic migration

Daisuke Ambe, Makoto Okazaki, Tomowo Watanabe, Hiroaki Kurogi and Seinen Chow

Oceanographic conditions in spawning ground and larvae transportation area of the Japanese eel

Hiroaki Kurogi

Ecology and annual recruitment levels of Japanese eel in Japan

Tae Won Lee

Ecology and recruitment of Japanese eel in Korea

Ruizhang Guan

Ecology and annual recruitment levels of Japanese eel in continent China

Wann-Nian Tzeng and Yu-San Han

Spatial and temporal variations in the recruitment of Japanese eel (*A. japonica*) in Taiwan

Tatsu Kishida and Kazuo Uchida

Management measures for eel in Europe

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Best Presentations for Committee/Program-sponsored Topic Sessions or Workshops at PICES-2012

Science Board Best Oral Presentation

Benjamin S. Halpern (National Center for Ecological Analysis and Synthesis, Santa Barbara, USA) on “The Ocean Health Index: Global assessment and future priorities”

Science Board Best Poster

Kuninao Tada (Kagawa University, Japan) on “Decrease of surface water nutrient concentration and nutrient flux from the sediment in Harima-Nada, Eastern Seto Inland Sea, Japan” co-authored with Miho Kayama, Naoto Hirade, Hitomi Yamaguchi, Supaporn Yamaguchi, Kazuhiro Harada, Minoru Tanda, Munehiro Fujiwara, Kazuhiko Ichimi and Tsuneo Honjo

Best Oral Presentation by an early career scientist for the BIO-sponsored Contributed Paper Session

Tabitha C.Y. Hui (Hokkaido University, Japan) on “Spatial, temporal and dietary overlap between harbour seals and fisheries in Erimo, Japan: Conflict at sea?” co-authored with Yumi Kobayashi, Yoko Mitani, Kei Fujii, Kei Hayashi and Kazushi Miyashita

Best Poster for the BIO-sponsored Contributed Paper Session

Chivuki Sassa (Seikai National Fisheries Research Institute, Fisheries Research Agency, Japan) on “Seasonal occurrence of mesopelagic fish larvae in the onshore side of the Kuroshio off southern Japan” co-authored with Yuichi Hirota

Best Oral Presentation by an early career scientist for the FIS-sponsored Contributed Paper Session

Xun Zhang (Hokkaido University, Japan) on “Spatial modeling of the potential fishing zone of Japanese common squid in coastal waters of southwestern Hokkaido, Japan” co-authored with Sei-Ichi Saitoh and Toru Hirawake

Best Poster for the FIS-sponsored Contributed Paper Session

Atsushi Tawa (Kyushu University, Fukuoka, Japan) on “High dispersal of moray eel larvae to the open ocean: Early life history estimated from ocean-wide distribution patterns” co-authored with Taku Yoshimura and Noritaka Mochioka

Best Oral Presentation by an early career scientist for the MEQ-sponsored BIO/MEQ/FUTURE Topic Session on “Ecosystem responses to multiple stressors in the North Pacific” (S10)

Kyung-Su Kim (Pukyong National University, Korea) on “The combined effects of elevated carbon dioxide concentration and temperature on the early development stage of olive flounder *Paralichthys olivaceus*” co-authored with JeongHee Shim and Suam Kim

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Kanako Naito (Prefectural University of Hiroshima, Japan) on “Iron as a triggering factor for harmful dinoflagellate blooms” co-authored with Setsuko Sakamoto, Mineo Yamaguchi, Ichiro Imai and Ken-ichi Nakamura

Best Oral Presentation by an early career scientist for the POC-sponsored Contributed Paper Session

Yoshi N. Sasaki (Hokkaido University, Sapporo, Japan) on “Interannual to decadal variability of the Gulf Stream and Kuroshio Extension jets” co-authored with Shoshiro Minobe and Niklas Schneider

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Sachihiko Itoh (The University of Tokyo, Japan) on “Strong vertical mixing in the Urup Strait, Kuril Islands” co-authored with Ichiro Yasuda, Masahiro Yagi, Satoshi Osafune, Hitoshi Kaneko, Jun Nishioka, Takeshi Nakatsuka and Yuri N. Volkov

Best Oral Presentation by an early career scientist for the MONITOR-sponsored MONITOR/POC_Topic Session on “Effects of natural and artificial calamities on marine ecosystems and the scheme for their mitigation” (S11)

Toshihiro Wada (Fukushima Prefectural Fisheries Experimental Station, Japan) on “Tsunami disaster and nuclear power plant accident effects on fishery facilities and marine products in Fukushima Prefecture: Present conditions and prospects” co-authored with Yoshiharu Nemoto, Shinya Shimamura and Satoshi Igarashi

Best Poster for the MONITOR-sponsored MONITOR/POC Topic Session on “Effects of natural and artificial calamities on marine ecosystems and the scheme for their mitigation” (S11)

Hideki Kaeriyama (National Research Institute of Fisheries Science, Kanagawa, Japan) on “Oceanic dispersion of radioactive cesium around Japan and western North Pacific after the Fukushima Dai-ichi Nuclear Power Plant accident” co-authored with Daisuke Ambe, Masachika Masujima, Kou Nishiuchi, Ken Fujimoto, Tsuneo Ono and Tomowo Watanabe

Best Oral Presentation by an early career scientist for the TCODE-sponsored POC/TCODE Topic Session on “Changing ocean biogeochemistry and its ecosystem impacts”(S14)

Shuchai Gan (East China Normal University, Shanghai, People’s Republic of China) on “Quantification of BDOC (bio-available dissolved organic carbon) of different water masses in East China Sea” co-authored with Ying Wu

Best Poster for the TCODE-sponsored POC/TCODE Topic Session on “Changing ocean biogeochemistry and its ecosystem impacts” (S14)

Lidia Yebra (Centro Oceanográfico de Málaga, Spanish Institute of Oceanography, Spain) on “Active carbon flux by diel migrant zooplankton in the eutrophic and oligotrophic waters of the Canary Current” co-authored with Sébastien Putzeys, Carlos Almeida, Pierrick Bécognée, Ángeles Marrero Diaz and Santiago Hernández-León

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